LITERATURE SEARCH
on the
PRESERVATION OF FOODS BY FREEZING

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By

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The State Engineering Experiment Station of the Georgia School of Technology is the engineering and industrial research agency of the University System of Georgia. It serves to coordinate and advance the research activities of the School through an integrated program of fundamental and applied research and development, for the purpose of contributing to the general welfare of the State. It is organized to aid directly in the development and integration of industrial and agricultural activities and the better utilization of resources in the South, through its investigations and technological studies.

The affairs of the Station are administered by the Director with the counsel of the Faculty Advisory Council, which consists of members appointed from the faculties of the Georgia School of Technology and other units of the University System of Georgia. The Staff is made up of a Director, Assistant Director, full-time Research Professors, Associate Professors, Assistant Professors, Fellows, Assistants, and Consultants; Faculty Research Associates; and Research Graduate and Technical Assistants.

Faculty members of the School are encouraged to engage in scientific research along with their teaching duties. These men have at their disposal a variety of special research equipment and facilities in the Station, in addition to the regular equipment available to them in the various departments of the School.

To make the results of its scientific investigations available to the public, the State Engineering Experiment Station publishes and distributes technical bulletins. It also publishes circulars which present important information that is not otherwise readily accessible to the public and to the engineering profession; reprints of articles written for technical periodicals by members of the Staff; and special reports prepared for a variety of purposes.

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Preface

This literature search on the quick freezing of fruits, vegetables, juices, meat, poultry, seafoods, fish, and precooked foods has been prepared in connection with the food preservation research program of the State Engineering Experiment Station of the Georgia School of Technology. In particular, it forms part of the long-term engineering research program on this topic which is jointly sponsored by the State Engineering Experiment Station and the Tennessee Valley Authority.

The preservation of food by freezing is now extensively employed throughout the country and, to some extent, throughout the world. Frozen foods are no longer looked upon as novelty items which may command a high price per se, regardless of quality. During the recent war, however, preserved foods of all types were in such demand that only research groups and some far-sighted producers of frozen foods made any determined effort to improve their freezing processes, varietal selections, and methods of preparation, packaging, storage, and transportation. Nevertheless, the gradual return to normal conditions of competition, while impeded by the need for feeding starving nations, now makes it appear certain that much attention will have to be given to these topics in the future. It is interesting to note, for example, that tentative standards for the bacterial examination of foods and for the control of frozen foods plants have recently been established (1946) by the U. S. Department of Agriculture (757).

The present search provides ample evidence that many of the factors involved have already been studied in considerable detail. Countless methods of freezing have been invented, and much technical data exist on the selection of species, methods of preparation, and the problems involved in and equipment required for storage, transportation, and marketing.

Scope of Search

This being the case, this search was prepared in an effort to gather together an indexed, expanded bibliography of the pertinent literature, so that future research might benefit through use of and acquaintance with the existing data. Despite its size, no attempt was made to make this search utterly exhaustive; the existence in this field of several specialized journals would have necessitated the inclusion of many references of doubtful importance if this had been required. It is believed, however, that most of the pertinent references have been included, since a considerable number of sources were cross-checked for this purpose.

The secondary literature sources employed in the early stages of this search were Chemical Abstracts, Biological Abstracts, the Engineering Index, and the Industrial Arts Index. In the first of these references, the indices to volumes 1-39 (1907-1945) were consulted on the following topics: antifreeze, bacteria, berries, blanching, cereals, cooling, cooling apparatus, digestibility, eggs, fish, foods, freezing, frozen foods, fruit, fruit juices, meat, milk, packaging, refrigerating apparatus, and refrigeration. Pertinent abstracts were then selected for reproduction in this report.

Biological Abstracts for 1926 through 1945 (volumes 1-19) was consulted on the following topics: blanching, canned foods, canning, cooking, dehydration, foods (general and, specifically, frozen, poisoning, and

preservation), freezing, fruits, meats, refrigeration, storage, vegetables, and vitamins. Several references were obtained by a search through pertinent sections of the first few issues for 1946; the same technique was employed for the 1945 volume, for which no index was at hand. In the Engineering Index, a search was made through the volumes for the years 1916-1944 on: agricultural engineering--refrigeration; cold storage; cold storage plants; containers; food products--containers, fruit, fish, meat, preservation, storage, transportation, vitamins; low-temperature engineering; meat; packaging--frozen foods; refrigeration--fish, food products, fruit, low-temperature, meat, poultry, vegetables; refrigeration engineering; storage; transportation; vegetables; and vitamins. Pertinent abstracts were obtained from both these sources.

The Industrial Arts Index was consulted under the following headings: blanching, blueberries, broccoli, cold storage, containers, cooling, eggs, fish, food (storage, frozen, containers), fruit, lima beans, meat, milk, oranges, peaches, peas, raspberries, spinach, strawberries, tomatoes, and vegetables. Direct reference was them made to the primary sources of those articles, books, and bulletins for which abstracts had not already been obtained, and abstracts were prepared as needed.

This latter procedure was also followed for additional references obtained from the Selected Bibliography on Freezing Preservation of Fruits and Vegetables, 1920-1945 of the Western Regional Research Laboratory of the U. S. Department of Agriculture; F. S. Erdman's Bibliography of Literature on Frozen Foods (655), and the chapter bibliographies in The Freezing Preservation of Foods (1525) by D. K. Tressler and C. F. Evers. Bibliographies in numerous articles and bulletins were also checked.

Primary dependence for patent references was placed upon a 1941 (unpublished) patent search prepared for the Tennessee Valley Authority by Arthur L. Davis; this search was based on patents classified in (or cross referenced to) Patent Office classes: 99-192, 99-193, 99-194, 99-195, and 99-198. Chemical Abstracts was employed for checking purposes and, on occasion, for abstracts of patents located elsewhere. As a final check for patents issued since 1941, reference was made to the index of the Official Gazette of the U. S. Patent Office for 1941-1945 on the following subjects: blanching, fish, food, freezing, frozen foods, fruit, meat, quick freezing, refrigeration, vegetables, etc. It is by no means certain that all pertinent patents have been located, however, and additional references may have to be included in a later supplement.

It should be noted that the patent abstracts are, in general, "partial abstracts"; i.e., related chiefly to one or two claims. However, it is probable that the dominant features of the patents have been relatively well covered in spite of the necessity for using this technique.

The literature abstracts are arranged in order of authors' surnames, while the patents are in numerical order under their respective countries of issue. Source references are given for those abstracts which were obtained from Chemical Abstracts (C. A.), Biological Abstracts (B. A.), the Engineering Index (E. I.), the Chemisches Zentralblatt (C. Z.), the "Erdman Bibliography" (E. B.), the Official Gazette of the U. S. Patent Office (Off. Gaz.), and two available Tennessee Valley Authority (T. V. A.) patent searches. Abstractors' initials are given for those abstracts which were prepared directly.

For the sake of easier use, all arbitrary abbreviations which were used by the various abstract journals were eliminated before the ab-

stracts were reproduced. In addition, all references to temperatures in Chemical Abstracts were identified (unless otherwise noted) as "°C." While definite rules for abstract forms were followed, incidentally, no attempt was made to change the abbreviations of journal titles used by the various abstract sources, since an untoward amount of work would have been required.

This volume does not contain those references which deal exclusively with the freezing of milk and eggs. Such references were noted, however, and may be included in a later supplement. Also, references to locker plants, home freezing, etc., were included only when they contributed engineering or other information of value to food freezing in general. No attempt was made to include all references to refrigeration. As the Station's research on food preservation progresses, it is quite likely that supplements to this search will be required to bring it up to date and to include references to previously unconnected topics.

Index

The alphabetical subject index which appears at the back of this volume is based upon the abstracts themselves and is therefore only as complete as these are. An attempt was made, however, to provide adequate cross-referencing, and it appears likely that few major omissions have occurred. Numbers listed in the index are abstract numbers, not page references.

Insofar as possible, all references to the freezing of specific items and the properties of the frozen products are collected under the items in question. In all cases, however, reference should also be made to such general classes as "Vegetables," "Fruits," "Packaging," "Storage," "Bacteria," "Vitamins," etc. A number of important subjects are also indexed under "Foods" and "Freezing"; freezing methods are classified under the latter heading. Consultation of related subjects is recommended.

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This search was prepared with the cooperation and encouragement of Dr. Frederick Bellinger, project director of the quick freezing program at the State Engineering Experiment Station; Dr. Gerald A. Rosselot, director of the Station; and Dr. Paul Weber, assistant director. Its scope is in large measure attributable to the searching and abstracting of Frances Sterne, William B. Cown, Edward L. Eckholm, Edna M. Fear, John R. Poer, and Betsey J. White. Biological and related subjects were indexed by Frances Sterne. Acknowledgement is also made to Joseph B. Hosmer for his general advice and to Rebecca Christian, Bessie Cheek, Paul Latimer, and Marjorie Naab for their assistance in the preparation of the final copy.

This search has been prepared by the Station's Technical Information Division as part of its program to organize and make more readily available the information contained in the technical literature. It is hoped that searches of this type will help in the development of better processes and products, thereby contributing to the development of Georgia, the South, and the nation as a whole.

B. H. WEIL
Chief, Technical Information
Division

(1) Anon., "St. Pierre Fish Freezer." Refrig. World 56, No. 1, 11-16 (1921). - Fish freezing and storage plant built for French Government on Island of St. Pierre. Machinery equipment and storage facilities are designed to take care of freezing of 200,000 barrels of fish in 24 hours and storing of 6,000,000 pounds of fish, boxed ready for shipment.
E. I. 1921, 443.

(2) Anon., "Fungi on Frozen Meat." Scientific Am. 125A, No. 17, 57 (Nov., 1921). - Discussion of the "black spot" and other types of fungi found on chilled and frozen meat when stored for long periods as reported in "Special Report No. 6 of the Food Investigation Board of Great Britain."
F. F.

(3) Anon., "Methods of Freezing Fish I." S. African J. Industries 4, 629-37 (1921). - A discussion of the handling of large quantities of common fish such as herring or spats during a glut, so that they may be held in storage until the market is capable of absorbing them, or to keep a canning factory in steady employment. Freezing in brine cooled to -12° C. for 1 hour is recommended as the best method for herring. The ice block method is not so economical and the glazing process is not applicable to handling gluts as the brine method. Packing the fish in boxes, stacking boxes to allow least possible air space, and maintaining as constant temperature as possible are recommended for cold storage of frozen fish to preserve flavor and color and prevent bacterial growth. The brine method checks the multiplication of bacteria and partially sterilizes the surface of the fish. Thawing may be carried out in air or H_2O.
C. A. 15, 3879 (1921).

(4) Anon., "Histological Changes Produced in Fish by Freezing in Air and in Brine." Refrig. Eng. 9, 105-6 (Sept., 1922). - Digest of article appearing in Ice and Cold Storage, London, August, 1922. Recent researches of Drooglever Fortugn in Holland and by Reuter in Germany demonstrate that the greater the velocity of freezing a tissue, the greater the likelihood of the tissue regaining its original condition on thawing. Experiments show the structure of the muscle of very rapidly frozen pieces of haddock was indistinguishable from that of fresh unfrozen fish. Different rates of freezing were attained by freezing in liquid carbon-dioxide, brine, and air mediums.
W. B. C.

(5) Anon., "Frozen Meat in Germany." Cold Storage 27, No. 311, 43-4 (1924). - Brief description of Bremerhaven plant.
E. I. 1924, 175.

(7) Anon., "The Ottesen Method of Preserving Fish." Boll. Pesce, Piscicolt e Idrobiol 3, No. 2, 3-14 (1927). - The various results obtained with quick and slow freezing are dealt with, Ottesen's discovery of a means of freezing without formation of crystals being described in detail.
B. A. 5, 169 (1931).

(8) Anon., "The Australian Meat Industry; the Economic Importance of the Satisfactory Freezing of Beef." J. Council Sci. & Indust. Res. 1, No. 1, 43-48 (1927).

(9) Anon., "Report of the Australian Meat Industry." J. Council Sci. & Indust. Res. (Australia) 1, No. 2, 81-92 (1927). - It is proposed to establish a cattle breeding experiment station ... (at this station along with other problems), the chilling and freezing of meat and methods of storage would be studied; ... harbor trusts to be approached for installing modern methods of loading frozen meat, and research on the defrosting of meat are to be improved for the benefit of producer and consumer.

F.F.

(10) Anon., "Status of Question of Meat Thawing." Refrig. Eng. 13, 352 (May, 1927). - Review of article appearing in Eis und Kaelte Industrie, Wein, March, 1927. Discussion of process recommended for scientific defrosting of meat based on experiments made by Edward Kallert. Frozen meat should be defrosted in large pieces to reduce waste of meat juice; humidity of storage room should be 90-95% to reduce weight loss; and defrosted meat must be kept in a chilling room for a period of 6 - 7 days to ripen. Meat treated in this manner cannot be distinguished from ordinary fresh chilled meat and can be kept safely in store during 8 to 10 days.

W. B. C.

(11) Anon., Freezing of Meat and Fish. Danish Foreign Office Journal No. 88, 1928. pp. 45-48. - Ottesen process is result of efforts to preserve meat and fish without impairing their original qualities; under certain circumstances fish and meat may be immersed in strong brine at low temperature without penetration of salt; fish or meat frozen by Ottesen process are not actually frozen as air-frozen fish or meat are, though their temperature may be equally reduced; plants for fish freezing operating exclusively under Ottesen patents have been built.

E. I. 1928, 1579.

(12) Anon., "The Birdseye Rapid Freezing System." Cold Storage 32, No. 374, 149 (1929). - Freezing process for preservation and preparation of foodstuffs developed by General Seafoods Corp. of Gloucester, Mass.; product to be frozen is fed on receiving end of lower of two flexible noncorroding Monel-metal belts which pass into insulated freezing tunnel; two belts grip product firmly while it is in transit, and relinquish it automatically at delivery end of apparatus.

E. I. 1929, 1575.

(13) Anon., "Australian Research in Fish Freezing." Cold Storage 32, No. 377, 250 (1929). - Rapid freezing of fish as a means of avoiding tissue injury has become a subject of considerable inquiry and research; brine and air processes compared; description and result of tests.

E. I. 1929, 1574.

(14) Anon., "All About Frozen & Chilled Meat." Cold Storage 32, No. 380, 367 (1929). - Consensus of leading experts on refrigerated meat technique;

refrigeration; transport; inspection; storage; summary of results. Review of Dept. of Sci. & Indus. Research - Food Investigation Special Report No. 36.

E. I. 1929, 479.

(15) Anon., "Developments in Application of Low-Temperature Brine Freezing." *Cold Storage* *32*, No. 381, 391-392 (1929). - Development of quick freezing brings nearer, for all connected with production, preparation, marketing, and consumption of perishable foods, facility which bids fair to place them on even footing with producers and manufacturers of non-perishable goods; survey of quick-freezing methods.

E. I. 1930, 1501.

(16) Anon., "The Freezing of Fish on Ship or Shore." *Cold Storage* *32*, No. 381, 393 (1929); *33*, No. 382, 12-13 (1930). - Efficient methods of preserving freshly caught fish; rapid chilling necessary. Jan. 16: Rapid wet chilling methods; specific reference to installation of 50-ton freezing capacity; experiments at sea.

E. I. 1930, 1499.

(17) Anon., "The Quick Freezing of Meat." *Ice & Cold Storage* *32*, No. 381, 300-302 (1929). - Possibilities of new merchandising methods surveyed at meat packers convention; cold plate freezing; package and freezing costs; handling frozen meats; marketing quick frozen products; merchandising methods changing.

E. I. 1930, 1502.

(18) Anon., "Birdseye Method of Freezing Fish." *Ice & Refrig.* *76*, No. 4, 321-4 (1929). - New method of preserving and preparing frozen fish for market now in successful operation in plants along Atlantic seaboard; quick freezing machine recently invented, using elastic metallic belts with calcium chloride brine, is basis of new project.

E. I. 1929, 1574.

(19) Anon., "The Kolbe Floating Pan Instant Freezing System." *Ice & Refrig.* *77*, No. 3, 153-4 (1929). - Kolbe method of preserving and preparing frozen fish for market by floating pan rapid-freezing system now in successful operation; offers advantages of simplicity and cheapness of construction as well as requiring only small space; long raceway containing cold brine is basis of system.

E. I. 1929, 1574.

(21) Anon., "Preservation of Fish by the Otteson Process." *Revue Industrielle* *59*, No. 2236, 158-162 (1929). - According to this process fish is immersed directly in brine which, due to rapidity of freezing, gives better results than freezing in free air; details of installation at Lorient, and results of experiments.

E. I. 1929, 1574.

(22) Anon., "The 'Z' Rapid Freezing Process." *Cold Storage* *33*, No. 385, 109 (1930). - Freezing and chilling process invented by Zarotschenzeff applied to meat cuts, fish, fruit as employed in experimental plant.

E. I. 1930, 1500.

(23) Anon., "Progress in Rapid Freezing." Cold Storage 33, No. 389, 235-236 (1930). - Progress in application of rapid freezing for small user; specific plants where process has been adopted; "Z" process of quick freezing making important progress in England, France, Norway, and Italy.
E. I. 1930, 1500.

(24) Anon., "Packaging Materials." Food Indust. 2, No. 1, 13-41 (1930). - Symposium of following articles: "What Cellophane Offers Foodstuffs," L. B. Steel; "Glassine and Wax Papers," H. A. Stone; "Paper Cups," L. V. Keefe; "Genuine Vegetable Parchment," G. F. DesAustels; "New Developments in Folding Boxes," J. D. Malcolmson; "Corrugated Cartons," H. H. Squire; "Paper Sacks," K. L. Allen; "Cotton Bag," J. S. Graham; "Metal Foil," W.C. White; "Stockinettes," P. F. Ashe; "New Ways of Using Metal Foil," F. H. Drexler; "Tin Cans"; "Glass Containers," K. L. Ford; "Wooden Barrel," L. F. Horn; "Steel Barrel," H. Merkery; "Wooden Boxes," P. L. Grady; "Simplification of Consumers Food Packages," W. E. Braithwaite; "Why and Wherefore of Closures for Glass Containers," S. H. Ayers; "Mechanics of Labeling," G. T. Jahnke.
E. I. 1930, 748.

(25) Anon., "Frozen Foods Number (of Food Industries)." Food Ind. 2, 145-88 (April, 1930).

(26) Anon., "Where the Peterson Rapid Freezing Systems Stand Today." Food Industries 2, No. 4, 173-4 (1930). - Historical review of Peterson systems; output of plants in which Peterson system has been installed.
E. I. 1930, 1500.

(27) Anon., "Freezing Peaches for Table Use." Food Ind. 2, 410 (1930).

(28) Anon., "The Freezing of Bacon." Ice & Cold Storage 33, No. 389, 200 (1930). - Experiments carried out in New Zealand on cured pork, together with observations and results obtained.
E. I. 1930, 1501.

(29) Anon., "Report of Committee on State and National Experimental Investigation." Ice & Refrig. 78, No. 6, 519 (1930). - Frozen-pack method of preserving fruits; removal of spray residue from apples and pears; storage and transportation of citrus fruits; sterlization of citrus fruits in Florida. Abstract of paper presented before Am. Inst. Refrig.
E. I. 1930, 411.

(30) Anon., "Development of the Frozen Food Industry." Ice and Refrig. 78, No. 6, 543-546 (1930). - Frozen meats; fish freezing; frozen egg industry; poultry freezing; cold pack system; marketing frozen foods.
E. I. 1930, 1499.

(31) Anon., "Quick Freezing of Wholesale Cuts of Meats." Ice & Refrig. 79, No. 1, 53-54 (1930). - Plan of new system adopted by Cudahy Brothers Co. in quick freezing of meats; operation confined to bulk cuts, leaving cutting and defrosting to local market; tests show gain in weight.
E. I. 1930, 1501.

(32) Anon., "Quick Freezing Cabinet for Experimental Purposes." Ice and Refrig. 79, No. 3, 219-220 (1930). - See also Cold Storage, Vol. 33, No. 390, Sept. 18, 1930, p. 261, 1 figure. Small unit designed to enable packers of various food products to carry on intelligent research work in quick freezing of foods; temperatures as low as 50 degrees Fahrenheit are easily maintained; temperature can be controlled.

E. I. 1930, 1496.

(33) Anon., "Quick Frozen and Fresh Packaged Meats." Ice & Refrig. 79, No. 3, 221-2 (1930). - Discussion by men prominent in production and distribution of meats on new development in retail selling of meat at meeting held under auspices of New York Marketing Council.

E. I. 1930, 1501.

(34) Anon., "Sales Experiment With Quick Frozen Meat in Indiana." Ice & Refrig. 79, No. 4, 287-8 (1930). - Method of retailing meats conducted in Muncie, Indiana, by Abattoir Corp.; experience proves necessity of complete series of cuts of lower grades of meats; supply cabinet.

E. I. 1930, 1501.

(35) Anon., "Preparing Apples for Quick Freeze Process." Ice & Refrig. 79, No. 4, 290 (1930). - Process of preserving fresh apples by freezing for use in baking pies; apples held in cold storage utilized when fresh product not available; relative merits of various methods of packing now in use; summary and conclusions drawn from experiments.

E. I. 1930, 1500.

(36) Anon., "Cold Storage Problems." Ice & Refrig. 79, No. 4, 291-292 (1930). - Importance of refrigeration after freezing; method of packing and handling strawberries in storage; shipping fruit out of storage after freezing; handling strawberries at point of destination. Paper presented before Northwest Fruit Barrelers Assn.

E. I. 1930, 410.

(37) Anon., "Refrigerator Case for Display of Frozen Food." Ice & Refrig. 79, No. 5, 392 (1930). - Display case designed especially for convenience of retailers handling frozen food products; meat packer announces results of experiment covering period of several months; construction and insulation details; designed to afford effective display and refrigeration.

E. I. 1930, 1500.

(38) Anon., "New Georgia Peach Freezing Plant." Ice & Refrig. 79, 393-6 (1930). - Plant of Tom Huston Frozen Foods, Inc., at Montezuma, Ga., provides initial step in placing frozen fresh fruit on market entire year round; description of refrigerating system; process used in preparing peaches, other fruits to be included.

E. I. 1930, 1500.

(39) Anon., "New Foods Refrigeration System." Ice & Refrig. 79, No. 5, 402-404 (1930). - Non-mechanical method of providing refrigeration in freight cars, truck delivery bodies and retail display units used for sale of quick-frozen foods; basic principle is creation of refrigerant at cen-

tral station; four interrelated units form system.
E. I. 1930, 1500.

(40) Anon., "Quick Freezing Grape Juice." Refrig. 48, No. 6, 30-32 (1930). - Design and operating characteristics of plant of Vita-Fruit Products at Lodi, Calif.; daily capacity of 30,000 gallons; frozen and held in containers for shipment.
E. I. 1930, 1500.

(41) Anon., "The Behavior of Meat in Cooling." Refrig. Eng. 19, 28-9 (Jan., 1930). - Discussion of study made by the British Food Investigation Board concerning the economic benefit of storing beef - palatability investigation of fresh, ripened and frozen beef.
W. B. C.

(42) Anon., "Brine Freezing on Fishing Vessels." Refrig. Eng. 19, 100-1 (March, 1930). - Discussion of recent invention of process by which fish can be frozen on the fishing vessel as fast as they are caught. Details of the construction and operation of the equipment are given.
W. B. C.

(43) Anon., "Quick-Freezing Fresh Fruits; Tom Huston Frozen Foods, Inc." Refrig. World 65, 21-2 (1930).

(44) Anon., "Cold Storage Does Not Destroy Important Vitamins in Foods." Siebel Tech. Rev. 5, No. 1, 9 (1930).

(45) Anon., Preserving Foodstuffs by Quick Freezing & Refrigeration. New York: McGraw Hill, 1931.

(46) Anon. Report of Food Investigation Board for Year 1930. Dept. Sci. & Indust. Research, His Majesty's Stationery Office, London, 1931. - Part I contains five sections: Meat; fruit and vegetables; pork, bacon, and hams; biological engineering; canning. Parts II - IV deal with other types of research.
F.F.

(47) Anon., "Frozen Foods - Today and Tomorrow." Food Industries 3, No. 1, 15-16 (1931). - Possibilities of frozen food products; experimental work; forecast of further advances.
E. I. 1931, 594.

(48) Anon., "Refrigerated Foods Call for Specific Containers." Food Ind. 3, 221-222 (1931). - A discussion of the various types of frozen food products packing and shipping, containers and their advantages.
E. M. F.

(49) Anon., "Peterson Rapid Freezing System." Ice and Cold Storage 34, No. 394, 19-20 (1931). - Early history and development; cycle of operations.
E. I. 1931, 1205.

(50) Anon., "Zarotschenzeff Quick Freezing Process." Ice & Refrig. 80, No. 6, 503-507 (1931). - Atomized brine system of quick freezing to be introduced in America; progress of development of system in Europe graphically portrayed; freezing of fish, meats, fruits, berries and fruit juices outlined; carton packing, storing and shipping products.
E. I. 1931, 1206.

(51) Anon., "Experiments on Freezing Vegetables and Fruits. - Low Temperature Research Station, Cambridge, England." Ice & Refrig. 81, 85 (1931).

(52) Anon., "Portable Equipment for Quick-Freezing Foods." Ice & Refrig. 81, No. 5, 340-341 (1931). - New multi-plate froster announced by General Foods Corp. operating under basic patent rights of original Birdseye process; apparatus enclosed in insulated cabinet; will freeze 2 in. packages in less than 90 minutes; direct expansion, single stage compressor using ammonia as refrigerant.
E. I. 1931, 1203.

*(53) Anon., "Fresh-N-Ice, New Quick-Freeze Process." Ice & Refrig. 81, No. 6, 475-76 (1931). - New method of quick-freezing fruits and vegetables; process designed to be used in any commercial ice making plant; food material submerged in liquid and frozen, used by fruit and vegetable packers; sketch of proposed plant designed for use of Fresh-N-Ice process.
E. I. 1931, 1205.

(54) Anon., "Halting Moisture Loss in Quick Frozen Foods." National Provisioner 84, No. 20, 27 (1931).

(55) Anon., "Frozen Food Situation." Refrig. Eng. 21, No. 4, 267-268, 292 (1931). - Outlook for 1931; freezing of foods; refrigeration as factor in marketing; what has been done; production problem. Before Am. Soc. Refrig. Engrs.
E. I. 1931, 1205.

(56) Anon., "Freezing Florida Oranges." Refrig. Eng. 21, No. 5, 320 (1931). - New process which involves use of specially constructed vertical freezer.
E. I. 1931, 1206.

(57) Anon., "Ordinary Cold Storage Temperature Successful for Frozen Pack Method." Fruit Prod. J. 12, No. 2, 43 (1932); Canning Trade 55, No. 9, 15 (1932); Ice & Refrig. 83, 194 (1932).

(58) Anon., "Developments in Quick Freezing." Ice & Refrig. 82, No. 3, 213-4 (1932). - Report on activities of Bureau of Fisheries in experiments with quick frozen fish; increase in fishery products; advantages of quick freezing based upon research work; public acceptance of products.
E. I. 1932, 1110.

(59) Anon., "Frozen Peaches on Display." Ice & Refrig. 82, 216 (1932).

(60) Anon., "Preservation Freezing - Effects on Quality of Fruits & Vegetables." Ice & Refrig. 82, No. 4, 313-14 (1932). - Resume of bulletin published by Georgia Experiment Station on preservation of foods by freezing; compilation of data on development of quick freezing; micro-physical changes in plant cells due to freezing; biological activity; physical changes; summary and conclusions.

E. I. 1932, 1111.

(61) Anon., "Reducing Shrinkage of Frozen Fish in Cold Storage." Ice & Refrig. 82, No. 5, 379 (1932). - Review of bulletin issued by Bureau of Fisheries, U. S. Department of Commerce; recommends oils as superior to practice of glazing fish with coat of ice to prevent moisture evaporation; cost of oil treatment compares favorably.

E. I. 1932, 278.

(62) Anon., "Atomized Brine Spray Freezing System." Refrig. Eng. 23, No. 2, 103 (1932). - "Z" process consists in maintaining very rapid heat trans fer at surface of product to be frozen by means of brine at about 0° F.; curves and data of freezing time of fish immersed in brine.

E. I. 1932, 1110.

(63) Anon., "Experiment Stations Conduct Tests in Quick-Freezing of Various Foods." Refrig. Eng. 23, 352 (June, 1932). - General account of frozen food research being conducted by Agricultural Experiment Stations in a number of states. Information is of general nature.

W. B. C.

(64) Anon., "Frozen Foods Research Work." Refrig. World 67, 27-8 (1932).

(65) Anon., "Botulinus and Frozen Fruit." Refrig. World 67, 52 (1932).

(66) Anon., "Quick-Freezing Preserves Fresh Quality of Poultry." Food Ind. 5, 496 (1933).

(67) Anon., "Refrigerating Progress During 1932." Ice & Cold Storage 36, No. 418, 3-8 (1933). - Railway air conditioning systems; cooling and heating control; air-conditioning for marine use; land installations; transport of perishable foods; railway developments; solid carbon-dioxide; quick freezing and frozen foods; refrigerating plant development; chilled beef.

E. I. 1933, 959.

(68) Anon., "Condensation on Chilled and Frozen Products." Ice & Refrig. 85, No. 1, 25-6 (1933). - Reasons for "sweating" of chilled and frozen products when taken out of cold storage; mechanism of condensation and methods of avoiding it; laboratory demonstration; landing chilled products on wharf from ship with no cold storage plant nearby.

E. I. 1933, 243.

(69) Anon., "Microbiology of Frozen Foods." Ice & Refrig. 85, No. 2, 75-6 (1933). - Review of several articles published in Am. J. Pub. Health, July

1933; bacterial content of frozen hamburg steak; longevity of bacteria in cherries, toxin formation in frozen fruits and vegetables; effect of freezing upon Clostridium batulinum; bacteria in frozen vegetables.

E. I. 1933, 959.

(70) Anon., "Food Freezing Systems." Refrig. Eng. 25, 356 (June, 1933). - Brief discussion and description of the "Z", Mathews, Birdseye, and Vogt freezing systems. The Mathews and the "Z" systems are designs using brine and a closed container. Freezing may be periodic or continuous. The Vogt instant freezer is used mostly in making ice cream. Freezing units may be installed in railroad cars for freezing at the source of product.

W. B. C.

(71) Anon. Report of Food Investigation Board for Year 1933. Dept. Sci. & Indust. Research, His Majesty's Stationery Office, London, 1934. 248 pages. - Summary of latest progress in investigation carried out at Low Temperature Research Station, Torry Research Station, and Ditton Laboratory; extramural work. Bibliography.

E.I. 1934, 469.

(72) Anon., "Britains First Low Temperature Fish Store." Cold Storage 37, No. 436, 164-5 (1934). - Store put into operation by new Grimsby Cold Storage Co.; low temperature brine freezing of whole fish as solution to preservation on land of fish trawled in distant waters.

E.I. 1934, 239.

(73) Anon. Report of Food Investigation Board for Year 1934. Department of Scientific and Industrial Research, His Majesty's Stationery Office, London, 1935. - Research of the board on such topics as meat, bacon, herring and kippers, fruits and vegetables, ripening of bananas, gas storage of fruit, tomatoes and potatoes, eggs, effects of radiation on bacteria.

(74) Anon., "'Z' Process in Chicago." Ice & Refrig. 88, No. 3, 203-4 (1935). - Experimental quick-freezing plant installed by United States Cold Storage & Ice Co., Chicago; operating details of demonstration unit; tests and demonstrations; preparation and packing of quick-frozen meats.

E. I. 1935, 912.

(75) Anon., "Bacterial Studies of Defrosted Peas, Spinach, and Lima Beans." Ice & Refrig. 88, No. 5, 343-4 (1935). - Study of bacterial content of defrosted specimens of commonly frozen vegetables; comparisons between fresh and defrosted vegetables frozen in laboratory; bacterial counts on fresh vegetables remain lower than those defrosted.

E. I. 1935, 913.

(76) Anon., "The Development of Frigoplate Process." Ziet fuer Eis - u. Kaelte - Industrie 28, No. 12, 5-8 (1935). - Development of Frigoplate process; review of developments in past year; use of frigoplate in stores and restaurants; illustrated examples of Frigoplate frost-covered and zero plates.

E. I. 1936, 954.

(77) Anon., "Freezing & Storage of Soft Fruits." Brit. Assn. Refrig. Proc. 32, No. 1, 63-83, 84-99 (1935-36). - Symposium including following papers: F. E. Garnett, Refrigeration on Fruit Farm (see abstract no. 745); T. N. Morris, Frozen Storage of Soft Fruits and Its Relation to Subsequent Processing; T. Rendle, Storage of Soft Fruit.

E. I. 1936, 954.

(78) Anon., "Novel Quick-Freezing Process." Cold Storage 39, No. 464, 264 (1936). - Features of "Bland Rapid Freezer" system; using mixture of one or more aliphatic alcohols with water; results of tests.

E. I. 1937, 980.

(79) Anon., "New Method of Quick Freezing." Food Indust. 8, 559 (1936). - Murphy process at Deerfield Packing Co. freezes 3,200 lb. batch of vegetables in $1\frac{1}{2}$ hours when operating at a temperature of -30° F. It freezes either loose or packaged vegetables by two simultaneous freezing processes through direct contact of product with refrigerated metal surface and forced circulation of frigid air. Improvements of Murphy process are discussed.

F. F.

(80) Anon., "Quick Frozen Vegetables Packed Direct From Farm." Ice & Refrig. 90, No. 1, 69-71 (1936). - Illustrated description of process used for quick freezing of peas and other vegetables grown on Seabrook Farms, Bridgeton, N.J.; canning factory of Deerfield Packing Corp. processing vegetables direct from farm; detailed method of handling green peas.

E. I. 1936, 955.

(81) Anon., "Progress of Frozen Foods." Ice & Refrig. 90, No. 4, 287-8 (1936). - Report on experimental work of National and state bureaus of Dept. of Agriculture; Frozen Pack Lab., Seattle, Wash.; N. Y. State Agricultural Exp. Sta.; - Part of report of Research Committee at 1936 annual meeting of Assn. Refrigerated Warehouses.

E. I. 1936, 954.

(82) Anon., "Quick Freezing of Peas." Ice & Refrig. 90, No. 6, 431 (1936). - Features of portable freezer for operation in harvesting fields developed by York Ice Machinery Corp. & Gen. Foods Corp.; Bozeman Co. wind tunnel for continuous quick freezing of peas.

E. I. 1936, 955.

(83) Anon., "New Refrigerating Apparatus Adapted for Freezing Fish." Ice & Refrig. 91, 135-6 (1936).

(84) Anon., "New Method of Quick Freezing." Ice & Refrig. 91, No. 6, 457-8 (1936). - Description of Murphy method installed at Deerfield Packing Corp., Bridgeton, N. J.

E. I. 1937, 980.

(85) Anon., "Birdseye Orders Portable York Refrigerating Systems." Refrig. Eng. 31, 304 (May, 1936). - Growing frozen foods market requires more portable frosters for fresh crops. Birdseye acquires portable frosters which

are transported from one harvesting field to another to freeze crops. Frozen peas is the main interest.

W. B. C.

(86) Anon., "Frozen Pack Food Industry." Food Indus. 9, No. 5, 290-300 (1937). - Classification of frozen packs; frozen fruit and vegetable packing methods; cost of operations; freezing and storage charges; frozen vegetable production; containers, transportation, distribution, and markets for frozen pack fruits, and how preserver, ice cream manufacturer and pie baker use them; institutional and retail market for frozen foods. Opportunity for increased market.

E. I. 1937, 980.

(87) Anon., "Vegetable Variety Trials in Relation to Freezing Preservation." Ice & Refrig. 92, No. 5, 364-5 (1937). - Report of results of investigation by Western Wash. Exper. Sta. to determine adaptability of certain varieties of vegetables to preservation by freezing.

E. I. 1937, 982.

(88) Anon., "Freezing Poultry from Inside." Ice & Refrig. 92, No. 6, 431-3 (1937). - Description of "Cridericed" process developed by Progress Packing Co., Chambersburg, Pa., for quick freezing by pumping brine at -3 to -5° F. and approximately 30 lb. pressure through fully dressed fowls.

E. I. 1937, 981.

(89) Anon., "Quick Freezing of Foodstuffs." Ice & Refrig. 93, No. 2, 125-7 (1937). - Subject of quick freezing given special consideration at Foods Preservation Conference held at U. of Texas, July 6 - 11; action on cell structure; animal tissue; low temperatures and quick freezing; problems ahead that must not be overlooked.

E. I. 1937, 980.

(90) Anon., "Freezing - Fast and Not So Fast." Refrig. Eng. 33, 243 (Apr., 1937). - Review of articles on two new systems of freezing retail foods. Mr. F. O. S. Bland - an English engineer - has invented a system consisting essentially of a moving belt which dips through a bath of cold solution whose temperature is -30° F. The composition of the liquid is a mixture of a mono-valent and a multi-valent alcohol with water such as 32% glycerine, 38% water and 30% ethyl alcohol. Steaks, fish and slices of meat froze in five to seven minutes, and poultry in 15 minutes. A. B. Haslacher of the "Fresh-N-Ice" Process Foods announced the use of a process where the brine tank of an ice plant was used in freezing food in containers similar to ice cream cans. The product was frozen wet with vegetables being submerged in water and berries and fruits in a syrup. Freezing time ran to as much as six hours.

W. B. C.

(91) Anon., "Novel Rapid Freezer." Refrig. Eng. 34, 228 (Oct., 1937). - Immersion freezer for rapidly freezing foods patented by F. O. S. Bland, a British refrigerating engineer, which employs a liquid medium consisting of two different aliphatic alcohols mixed with water in such proportion that the liquid remains fluid at a temperature of -40° F. Goods to be frozen are immersed in the liquid maintained at a temperature of -22° F. Claims are

made that the freezing proceeds at such rapid rate that practically no change takes place in the structure and that the liquid when maintained at proper low temperature is odorless, tasteless, and harmless. All sorts of foods have been frozen at the same time in the same liquid without one class of food absorbing the flavor from other foods in the same crate. Freezer is of continuous type.

W. B. C.

(92) Anon., "Abstracts of Refrigeration Papers Read at M.I.T. Conference, Sept. 17, 1937." Refrig. Eng. 34, No. 5, 305-7, 313 (1937). - M. Piettre, Technical Refrig. and Tests on Quick Freezing Applied to Meat Carcasses; Crystallization and Dessication of Certain Proteins at Low Temperatures; L. Berube, Modern Practice in Preservation of Fish by Cold; T. Moran and G. E. Reay, Freezing and Cold Storage of Herring; T. Moran, Gas Storage of Meat and Eggs; A.C. Fay, Current Technological Problems in Dairy and Ice Cream Industries; J. Holt, Air Conditioning for Food Plants; A.W. Ewell, Utilization of Ozone in Cold Storage; R.P. Jenkins, D.K. Tressler, A. Fitzgerald, Vitamin C Content in Vegetables. VIII, Frozen Peas. For abstracts of articles other than (5) and (6) see abstracts 362, 659, 890, 1148, 1251, and 1252.

E.I. 1937, 980.

(93) Anon., "Frozen Pack Varieties Named." Western Canner & Packer 29, No. 6, 19 (1937).

(94) Anon. The Story of Dried Fruits. California Dried Fruits Institute Bulletin, 1938.

(95) Anon., "Cold Storage Conditioning." Auto. Heat & Air Condit. 9, 34-5 and 52-4 (1938). - Processing foods for locker plant storage; calculations of various heat gains in rooms of locker plant.

E. B.

(96) Anon., "Freeze Food in Cans." Business Week, p. 19 (Nov. 26, 1938). - An announcement of four companies developing a continuous process of freezing food in cans and making available to the frozen food industry the production line methods of modern canneries. Retail prices for the canned frozen foods are expected to be considerably below those of present frozen-food products and only slightly higher than those of regular canned goods.

E. M. F.

(97) Anon., "Harold E. Hamblein Inc. Enters New Field of Quick Frozen Sea Foods." Fishing Gazette 55, No. 4, 20 (1938).

(98) Anon., "Quick Freezing Goes South." Fishing Gazette 55, No. 8, 18A-18B (1938).

(99) Anon., "What is Frozen Food?" Food Ind. 10, 236-8 (1938). - Discussion of general picture of frozen foods. Gives digest of pertinent facts about many methods: sharp, airblast, tunnel, single contact, double contact, spray or fog block, ice, immersion, and some unclassified methods.

F. F.

(100) Anon., "Frozen Foods Directory." Food Ind. 10, 239-49 (1938). - Tabular record of the various frozen foods companies gives quick reference tables of: Company; Plant locations; Products; Containers used; System in operation; Output for years 1936, 1937, and 1938.

F. F.

(101) Anon., "Frozen Food Problems Discussed at Conference." Food Ind. 10, 262 (1938). - Discussion of frozen foods at California Frozen Pack Conference, 1938. (1) D. G. Sorber: Transportation of asparagus, Brussels sprouts, and broccoli can be carried out successfully by icing while in transit. Tests with lima beans show that cooking time after thawing has a marked effect on quality. (2) W. Kuster discussed packaging and pointed out that air-tightness of the package was even more important than moisture proofness. Shape is important when freezing in package. (3) W. V. Cruess read a paper by J. A. Berry on subject of microbiology of frozen packs. Tests conducted to determine time and temperature of microbial growths. Emphasis put on freezing product as soon as possible or storing at very low temperatures until freezing. Blanching does not necessarily protect all products. (4) R. L. Perry: non-applicability of laws of thermodynamics to diameter of particles to be frozen. Velocity of air important in air-blast freezing. (5) M. A. Joslyn: Blanching not only essential for enzyme inactivation, but also in brightening the color of certain vegetables, apparently due to fixation of chlorophyll. (6) C. L. Bedford: Character of enzymes and rate of inactivation in blanching; the time and temperature necessary for the proper blanching depends upon the character of the vegetable, its maturity, and the rate of inactivation of the enzymes. (7) E. M. Choce: Future of frozen foods depends upon quality maintenance, establishment of brands, education of dealer and consumer.

F. F.

(102) Anon., "Vegetable Varieties for Freezing (Summary of Report of U. S. Department of Agriculture and Western Washington Experiment Station)." Ice & Refrig. 94, No. 6, 460 (1938). - Well selected varieties of peas, bush and pole snap beans and early-maturing sweet corn are well adapted to freezing preservation.

F. F.

(103) Anon., "Quick Freezing Process in England." Ice & Refrig. 95, No. 1, 29-30 (1938). - Brief survey of present status and development of frozen foods industry in England; English people readily accept good quality products; future outlook promising.

E. I. 1938, 1023.

(104). Anon., "Freezing Vegetables." Ice & Refrig. 95, No. 4, 279-80 (1938). - Description of vacuum quick freezing process used by California Consumers Corp.

E. I. 1938, 1024.

(105) Anon., "Food Preservation Conference." Ice & Refrig. 95, No. 6, 441-3 (1938). - Subjects discussed at conference at University of Tenn., Knoxville, Oct. 20 - 21, with cooperation of ASRE: refrigeration and food industry; farm and community refrigeration; bacteriological activity in foods; effect of freezing on vitamin content; effect of light rays; developments in quick freezing; packaging frozen foods; commercial aspects of

industry, etc.

E. I. 1938, 1023.

(106) Anon., "Quick Frozen Georgia Peaches Used for Cordials & Brandies." Refrig. Eng. 35, 126 (1938). - Two announcements made of use of frozen peaches by distilleries for use in making cordials & brandies suggests new market for large amounts of frozen fruits and berries. Process for use developed by Wm. R. Tucker.

F. F.

(107) Anon., "Abstracts of Food Conference Papers." Refrig. Eng. 36, No. 2, 100-3 (1938). - Abstracts of papers presented at State College, Pa., June 21 - 23, 1938; Influence of Controlled Temperatures on Ice Cream, R. C. Hibben; Requirements of Farm Electric Milk Coolers, J.E. Nicholas; Bacteria and Enzymes and their Relation to Food Preservation at Low Temperatures, M. O. Farrell; Refrigerated Locker Plants, A. A. Geiger; Precooling Eggs on Farm, J. E. Nicholas.

E. I. 1938, 1023.

(108) Anon., "Quick Freezing Operations of California Consumers Corporation." Refrig. Eng. 36, 272-4, 276 (1938). - The California Consumers Corp. are recognized for their endeavor in fields of ice and refrigeration. The Corporation has developed vacuum quick frozen citrus fruit juices and more recently has set up a plant for quick freezing of all types of products. Much good equipment has been developed in conjunction with their quick freezing projects.

F. F.

(109) Anon., "Discussion at the Second Food Preservation Conference (Knoxville, Tenn., Oct. 20 - 21, 1938)." Refrig. Eng. 36, 388-92 (1938). - Discussion following papers as presented by: (1) D. L. Fiske, Trend of Refrigeration Toward Food Producing Areas; (2) C. J. Herd, Community Refrigeration Storages; Dr. P. W. Allen, Bacteria the Friends & Foes of the Food Industry; (4) G. Fitzgerald, Effects of Freezing on Vitamin C Contents of Vegetables; (5) H. Rentschler, Control of Molds and Bacteria with Light; (6) R. B. Taylor, Quick Freezing of Fruits and Berries; (7) J. G. Woodroof, Comparing Methods of Preserving Fruits & Vegetables; (8) R. M. Bergstein, Packaging Frozen Foods; (9) H. Carlton, Some Commercial Aspects of the Frozen Food Industry; (10) W. E. Guest, Economics of Community Food Storage Plants; (11) C. T. Baker, Frozen Foods & Locker Plants in the South. For abstracts of these papers except (1), (2), (5) and (10), see abstracts 277, 303, 347, 472, 726, 1438, and 1632.

F. F.

(110) Anon., "Summary of Equipment and Supplies for Freezing Foods." Western Canner & Packer 30, No. 2, 21-36 (1938).

(111) Anon., "Major Expansion Program for Washington Frosted Foods." Western Canner & Packer 30, No. 5, 23-4 (1938).

(112) Anon., "Symposium of Papers on 'Quick Freezing'." Brit. Assn. Refrig. Proc. 35, No. 2, 26-35, 5-25 (1938-39). - Application of Low Tempera-

ture Conduction Freezing for Perishable Foods, W. T. Murray; Quick Freezing, W. S. Josephson (see abstract No. 903); Commercial Development of Quick Freezing in Great Britain and Empire, W. H. Peak; "Z" Process of Quick Freezing, W. G. Brettell.

E. I. 1939, 1005.

(113) Anon. Freezing of Meats, Fruits and Vegetables for Locker Storage. Idaho Experiment Station Circular 64, 1939.

(114) Anon. Proceedings of the First Convention of National Frozen Food Locker Association. National Food Locker Association, Des Moines, Iowa, 1939.

(115) Anon., "T.V.A. Quick-Freezing; Food Refrigeration Plant Leased to Private Interests after Barge Makes Big Sales." Business Week, p. 43 (June 3, 1939). - A brief explanation of the T.V.A. (Tennessee Valley Authority) quick freezing process development and the success of its experimental river distribution of frozen foods through the use of a floating refrigerator barge. This demonstrated waterway shipping, being less expensive than by rail, may eventually become an important method of transport.

E. M. F.

(116) Anon., "Frozen Foods - A New Industry in Progress." Can. Chem. & Processing Indust. 23, 308-9 (1939). - Review of Symposium presented at meeting of Toronto Chemical Association, May, 1939. Brief history & economic principles of industry are discussed. Technical aspects are also discussed: (1) Changes in meats during freezing storage; (2) Effects of freezing rate on quality of frozen meat and poultry; (3) Elimination of freezer burn by control of humidity and proper packaging; (4) Control of chemical changes which would result in loss of bloom and rancidity; (5) Blanching of vegetables and packing of fruits in syrup; (6) Variety selection of fruits & vegetables; (7) Rate of freezing and comparison of dry-pack & wet-pack methods of preparing frozen vegetables and fruits; (8) Storage temperatures for maintenance of quality and flavor. Article composed of reviews of following papers: W. G. McLeod on "History and Economics"; W. H. Cook on "Frozen Storage of Meat"; G. H. L. Truscott on "Frozen fruits and Vegetables."

F. F.

(117) Anon., "New Latex Wrapping." Cold Storage 42, No. 493, 87-8 (1939). - Notes on Cyro Vac wrappings for protecting chilled and frozen meat and poultry in transit; manufactured from odorless, flavorless form of Latex; wrappings hold their contents in vacuo, ensuring safety from mold attack and freedom from absorption of odors from other produce. See also: Mech. Eng. 61, No. 4, 317 (1939); Food Industries 11, No. 5, 250-1 (1939).

E. I. 1939, 480.

(118) Anon., "Producing Frosted Foods." Elec. Review (London) 125, 89-90 (1939).

(119) Anon., "Packages and Packaging Materials Used by the Frozen Foods In-

dustry." Food Indust. 11, 128-42 (1939). - Description and illustration of various types of packaging as furnished through questionnaires sent to manufacturers of frozen foods and to package manufacturers. Includes barrels, bulk tin containers, wooden boxes, folding boxes, prefabricated fiber containers, liners, outside carton wraps and other wraps, tin cans, tin-and-fiber cans, and shipping containers. Also discussed are the use of color on packages, types of labels, package accessories and packaging by machinery.

F. F.

(120) Anon., "Latex Rubber as a Frozen Food Container." Food Ind. 11, 250-251 (1939). - In this article, a container, and its use and advantages of its use in packaging foods before freezing, are described. From the information given, it is apparent that the new container holds promise for the solution of many knotty problems both in the freezing and in the marketing of frozen foods.

E. M. F.

(121) Anon., "Tentative U. S. Standards for Grades of Frozen Lima Beans." Food Indust. 11, 554A-554D (1939). - Frozen lima beans defined and graded according to uniformity of variety, color, percent of white Lima beans, conformity of size, lack of defects (loose skin, broken beans, etc.), tenderness, flavor, color and odor. Grading determined immediately after thorough thawing in tap water at room temperature. Complete explanations are given along with color plate for ascertaining color rating.

F. F.

(122) Anon., "The Operation of Refrigerated Warehouses at Large Centers of Production or Consumption." Genie Civil 115, No. 2968, 12-4 (1939). - Freezing and refrigeration of food products.

E. B.

(123) Anon., "New Gloucester Fish Pier Freezer." Ice & Refrig. 96, 511-13 (1939).

(124) Anon., "Quick Frozen Pea Standards." Quick Frozen Foods 1, No. 11, 30 (1939).

(125) Anon., "West Coast Firm to Freeze Products in Cans." Refrig. Eng. 37, 40 (1939). - Food Freezers, Inc., to operate plant for continuous freezing in cans of fruits, juices, vegetables, milk, eggs, and other products. See: Food Indust., V. 11, p. 10-11, 54, 1939.

F. F.

(126) Anon., "Food Distributors Plan Frozen Foods Institute." Refrig. Eng. 37, 115 (1939). - Announcement of meeting planned to set up institute at which meeting all problems of production and distribution are to be discussed.

F. F.

(127) Anon., "Baker Forced-Draft Refrigerating Unit for Quick-Freeze Room

of Locker Plants." Refrig. Eng. 37, 184 (1939). - Illustration and description of new refrigerating unit developed by Baker Ice Machine Co., Omaha, Nebraska. Cuts freezing time - vegetables frozen in 1 to 2 hours. Operational details given for sharp-freezing, thawing, and maintaining freezing storage temperatures.

F. F.

(128) Anon., "New System by Cold Controls, Inc., Used in Dry Ice Transit of Frozen Fruits." Refrig. Eng. 37, 260 (1939). - Milestone in use of dry ice as a refrigerant for quick frozen fruits and vegetables was reached when a shipment of strawberries was preserved by this method while in transit from Plant City, Fla., to Philadelphia, Pa. Details of shipping and tests made during shipping are given.

F. F.

(129) Anon., "Refrigerated Locker Storage for Fruits and Vegetables." Refrig. Eng. 38, 228 (1939). - A brief discussion of the contents of the sixteen page pamphlet, full of practical pointers on fruits and vegetables suited to freezing, preparation before packing, equipment and technique required, also paper and other containers, methods of handling in the freezer, and methods of thawing are included in Extension Circular 259 of the Iowa State College, Ames, Iowa.

E. M. F.

(130) Anon., "Tentative Frozen Pea Grades Announced by Federal Bureau." West. Canner & Packer 31, No. 4, 110 (1939).

(131) Anon., The Refrigerating Data Book. Fifth Edition. New York: American Society of Refrigeration Engineers, 1940. Volume II, Refrigeration Application. - Compendium of articles which are abstracted in the following references: 618, 619, 1016, 1379, 1441, 1518 and 1598.

F. F.

(132) Anon., "Chip Steak Creates Acceptance for Quick Frozen Meat." Food Indust. 12, No. 7, 64-5 (1940). - A description of the process for manufacturing chip steaks from beef and the advantages of this quick frozen meat product.

E. M. F.

(133) Anon., "Continuous Quick Freezer Developed by Birdseye." Food Industries 12, No. 9, 44-5 (1940). - Illustrated description of portable "gravity Froster" developed by Clarence Birdseye, which has automatic feed and discharge, takes little floor space, and freezes products loose without dehydration; designed primarily for quick freezing of bulk products and "loose" vegetables and small fruits; with refrigerant at -25° F., hourly capacity of 20 plate gravity froster is rated at 1600 pounds of vegetables and small fruits; ammonia liquor is refrigerant used.

E. I. 1940, 1022.

(134) Anon., "Rubber Bag in a Box; New Container for Frozen Foods." Food Indust. 12, No. 10, 67 (1940). - Latex rubber bags (previously used for packaging frozen poultry) adapted for packaging other frozen foods, especi-

ally frozen liquids. Bag is used in conjunction with fiberboard carton. This packaging prevents oxidation, mold growth, odor contamination, and freezer burn.

F. F.

(135) Anon., "Three Years of Progress in Food Freezing Methods." Food Industries 12, No. 12, 63-8 (1940). - Summary of methods of freezing in United States, bringing up to date, broad principles embodied in commercial freezing equipment; four new methods and many refinements of older systems characterize changes; Frozen Foods Directory given.

E. I. 1940, 1023.

(136) Anon., "Frozen Food Plant Installs New Freezing and Handling Equipment." Ice & Refrig. 98, No. 1, 73-5 (1940). - New freezing equipment and handling facilities installed by John H. Dulany & Son in their food processing plant at Exmore, Va., described; multi-stage tubular freezer installed; freezing, cooking and other tests; control of quality; speed of freezing regulated.

E. I. 1940, 1023.

(137) Anon., "Home Freezing Unit is Displayed by University of Texas." Ice & Refrig. 99, 351 (1940). - Unit developed by W. R. Woolrich, University of Texas, which utilizes the development of ice crystals. Through an agitation process the crystals are sheared off and help lower the temperature. A polyphase freezing solution, a vapor, liquid and ice mixture of sugar syrup freezing at minus 5° F. is used. Solution coats the produce with a thin film of sugar to prevent oxidation. Patents controlled by the University of Texas Research Corp.

W. B. C.

(138) Anon., "Bulk Quick-Freezing Package; New Latex Bag Lined Carton." Mod. Pkging. 14, 87 (1940).

(139) Anon., "Cold Stores for Great Britain." Mod. Refrig. 43, No. 512, 217-8 (1940).

(140) Anon., "Description of Consumer Size Packages." Quick Frozen Foods 2, No. 7, 21 (1940).

(141) Anon., "Possibilities of Freezing Aboard Ships." Refrig. Eng. 39, 166 (1940). - The French government is conducting experiments on freezing at sea which is merely mentioned in this article. It states that the necessity for shipping ice two ways on board ship adds further argument in favor of machinery for refrigeration and possibly quick freezing at sea.

E. M. F.

(142) Anon., "New Standards Set for (Frozen) Asparagus." Western Frozen Foods 1, No. 6, 5-6, 15 (1940).

(143) Anon., Birdseye Cook Book. New York: Frosted Foods Sales Corp., 1941.

(144) Anon., How to Prepare and Serve Finer Frosted Foods. Pittsburgh, Pa.: Little America Finer Frosted Foods Co., 1941.

(145) Anon. Some Economic Aspects of the Frozen Food Industry in Tenn. University of Tenn. Rural Research Series, Monograph No. 133, 1941.

(146) Anon., "Concentrating by Freezing to Protect Flavor." Food Indust. 13, No. 4, 50 (1941). - Solvent is partially frozen and removed from solution by mechanical means. Based on principle that slow freezing of a solution will result in separation of crystals of the pure solvent. A continuous machine for concentrating fruit juices is described.

W. B. C.

(147) Anon., "New Type of Quick Freezing Unit." Ice & Refrig. 100, 313-4 (1941). - Description of the Jackstone Roto Freezer invented by A. Jackson Stone. Froster consists of twenty-four pairs of freezing plates, mounted substantially parallel, radiating out from and attached to the revolving drum axis. Product to be frozen is placed between these plates. Each plate contains circulating tubes, which constitute an integral part through which the refrigerant circulates. Freezing operation is continuous and speed can be controlled to suit needs of product to be frozen. There is never any peak load on the compressor unit. Details are given.

W. B. C.

(148) Anon., "New Quick Freezing Unit Developed." Ice & Refrig. 101, 127-28 (1941). - Description of "Blizzard Freezer" developed by the Frick Co. of Waynesboro, Pa. Actually is a small, portable, tunnel freezer employing a temperature around minus 40 to 50° F. and air velocity up to 3500 feet per minute.

W. B. C.

(149) Anon., "Nature Fresh in Latex; Packaging Seals in Flavor of Frozen Foods." Mod. Pkging. 14, 44-5 (1941).

(150) Anon., "New Flexible Froster (2)." Quick Frozen Foods 3, No. 6, 32 (1941).

(151) Anon., "Methods of Quick Freezing." Refrig. Eng. 41, Application Data - Section 22, 1-6 (1941). - Tray and conveyor freezers for loose fruits and vegetables discussed under following headings: classification by form, classification by cooling media, preparation blanching, use of air for freezing, coil units and defrosting, loose freezing systems, freezing in stages.

E. I. 1941, 1026.

(152) Anon., "Georgia Research Recommends Freezing Foods Before Packing." Refrig. Eng. 42, 20 (1941). - This article cites the advantages of freezing fruits and vegetables individually rather than in mass. It also concludes that a superior product has been obtained by freezing the fruits and vegetables in direct contact with a cold solution, providing the proper medium is used to prevent desiccation. E. M. F.

(153) Anon., "Frozen Pack Increases Market for Wild Pheasant." Refrig. Eng. 42, 266 (1941). - The frozen pack method materially reduces the price of a vacuum pack of whole pheasant.

E. M. F.

(154) Anon., "The Cold Storage Plant of the Firm 'Girom' in Bucharest." Schweizerische Bauzeitung 118, No. 1, 7-9 (1941).

(155) Anon., "New Package for Frozen Cot Halves." Western Canner & Packer 33, No. 9, 43-4 (1941). - New type of pack for 25 to 30 pound bulk packages of frozen apricots.

F. F.

(156) Anon., "Duplex Bag Fits Needs for Locker Freezing and Storing." Western Canner & Packer 33, No. 12, 45 (1941). - Bag, developed by Thomas M. Royal & Co., is of duplex construction; liner of pliofilm and outer container of Wetwrap, a moisture-resisting paper. An unusual feature is that frozen product may be cooked in wrapper. Package is placed, unopened, in a pan of water and the contents cooked in their own juice, thus retaining minerals, vitamins, and flavor.

F. F.

(157) Anon., "Frozen Foods (Statistical Tables and Notes)." Western Canner & Packer - Yearbook, 1941.

(158) Anon., Modern Foods for Modern Menus With Miracle Quick Freezing. New York: Consumer Service Dept., Frosted Foods Sales Corp., 1942. Serial No. 6782. - Popular bulletin telling story of frozen foods; history, methods, time elements, freezing fruits and vegetables, freezing poultry. Cooking directions and time tables.

F. F.

(159) Anon. Beef: Boneless Frozen. Tentative Specification C.Q.D. No. 11C, U. S. Quartermaster Corps, May 11, 1942.

(160) Anon. Preparing Home Grown Vegetables and Fruits for Freezing. U.S. D.A. Bur. Ag. and Ind. Chem. Ag. Research Admin. AWI-63, Washington, D.C., 1942.

(161) Anon. Farm Freezing Units. Indiana Agric. Exp. Sta. Report, 1942. p. 36.

(162) Anon. Winter Quality in Frozen Fruits and Vegetables. Minnesota Agriculture Experiment Station Bulletin No. 362, 1942.

(163) Anon. Preparing Fruits & Vegetables for Refrigerated Locker Storage. Dept. Hort., Okla. A&M Col. Exp. Sta. Misc. Pub. No. MP-7, 1942.

(164) Anon., Charts. St. Louis, Mo.: St. Louis Bank for Cooperatives, 1942. - Economic survey of cooperative locker associations in Illinois presented in figures and charts.

E. B.

(165) Anon., "Aid for Canners - Dept. of Agriculture Develops Quick-Freeze Process to Keep Fruit Until Needed. Help on 1943 Crop Forecast." Business Week, p. 24 (Oct. 10, 1942). - Discussion of new development in peach industry. Announcement of process made by Western Region Laboratory: peaches may be quick frozen and held until facilities available for canning, thus cutting down on loss through spoilage during production peaks. Made possible through new defrosting procedure which preserves flavor and prevents discoloration. Process is not guaranteed to produce top grade fruit.

F. F.

(166) Anon., "Standards for Grades of Frozen Red Raspberries and Strawberries." Canner 95, No. 14, 15-17, 28; No. 19, 20-22; No. 21, 18, 24 (1942).

(167) Anon., "Mechanical System Proves Efficient for Refrigerating Trucks." Food Industries 14, No. 1, 70-1 (1942). - More uniform temperature and saving in expense obtained by equipping low temperature frozen food trucks with finned coils and compressor units; dry ice was formerly used.

E. I. 1942, 923.

(168) Anon., "Brief Summaries of Grade Standards." Food Ind. 14, No. 12, 67 & 95-99 (1942). - This article presents digests of standards issued by the Agricultural Marketing Administration for the convenience of those who control quality in the food industries. Among the standards given in this article are those for frozen strawberries and frozen red sour pitted cherries.

E. M. F.

(169) Anon., "Quick-Freezing Research." Mod. Refrig. 45, No. 526, 13-4 (1942). - Review of progress in laboratory research on food processing and preservation by freezing, as reported in 53rd Annual Report of Georgia Experiment Station of University of Georgia.

E. I. 1942, 922.

(170) Anon., "Railroad Storage Requirements for Quick Frozen Foods." Railway Age 112, 862-4 (May, 1942). - Discussion of need of special transporting and warehousing facilities in handling frozen foods. Railroad cars, trucks, and containers capable of maintaining low temperature refrigeration; refrigerated warehouses easily accessible to railroad tracks; and quick transfer of frozen product are needed. A shipping container - the church container - is a service offered by the Railway Express Company for transporting relatively small amounts of frozen food.

W. B. C.

(171) Anon. Frozen Pork and Beans of the Tomato Sauce Type. U.S. Dept. of Agriculture, Bureau of Agricultural and Industrial Chemistry, Western Regional Research Laboratory Mimeographed Circular A.I.C. 10, 1943. - Cf.

Western Canner and Packer 35, No. 12, 60-1 (1943); Food Packer 25, No. 1, 30-1 (1944).

F. F.

(172) Anon. A Test for Adequacy of Blanching in Frozen Vegetables. U.S. Dept. of Agriculture, Bureau of Agricultural and Industrial Chemistry, Western Regional Research Laboratory Mimeographed Circular A.I.C. 34, 1943. - For abstract see No. 209.

(173) Anon. The Determination of Ascorbic Acid in Fresh, Frozen, and Dehydrated Foods. U.S. Dept. of Agriculture, Bureau of Agricultural and Industrial Chemistry, Western Regional Research Laboratory Mimeographed Circular A.I.C. 35, 1943. - See abstract No. 1025.

(174) Anon. Freezing Preservation of Pumpkin Pie Stock. U.S. Dept. of Agriculture, Bureau of Agricultural and Industrial Chemistry, Western Regional Research Laboratory Mimeographed Circular A.I.C. 36, 1943. - Cf. Canner 98, No. 8, 18 (1944); Food Packer 25, No. 7, 33 (1944); Locker Operator 6, No. 1, 40-1 (1944); Western Canner and Packer 36, No. 2, 59 (1944); Western Frozen Foods 5, No. 5, 8-9 (1944).

F.F.

(175) Anon., Survey of Cooperative Cold Storage Locker Associations. St. Louis, Mo.: St. Louis Bank for Cooperatives, 1943. - Economic survey of cooperative locker associations of Illinois presented in figures and charts.

E. B.

(176) Anon. Freezing Preservation of Utah Fruit. Utah Agric. Exp. Sta. Bulletin No. 306, 1943. pp. 59-60. - The results of quality tests on varieties of frozen strawberries and raspberries are summarized. ... High acidity accompanied better and more intensive flavor, with grade A fruit having an acidity of 1% or better.

B. A. 19, 1542 (1945).

(177) Anon., "How to Cook Food for Quick Freezing." Food Industries 15, No. 10, 69 & 110 (1943). - Processing method for retaining flavor and vitamin content in pork and beans; formula modifications yield product with good consistency during thawing and heating. Results reported were obtained from samples of frozen pork and beans stored for 3 months. Based on "Information Sheet on Frozen Pork and Beans of Tomato Sauce Type," issued by U. S. Dept. of Agriculture, Albany, Calif.

E. I. 1943, 429.

(178) Anon., "Raspberries, Frozen - Brief Summaries of Grade Standards." Food Indust. 15, 70 (1943). - Abstract contains the principal requirements of the standards issued by the Agricultural Marketing Administration of the Department of Agriculture for grading frozen red raspberries according to the quality factors of color, absence of defects, and character of fruit in addition to indication of whether or not the fruit is packed with sugar or sirup.

E. M. F.

(179) Anon., "Frozen Foods Directory." Food Indust. 15, No. 11, 78-98 (1943). - Companies engaged in freezing; types, package sizes, and quantities produced by each.

E. B.

(180) Anon., "Washington Frozen Food Packer Expands Plant Facilities." Ice & Refrig. 104, No. 5, 278-80 (1943). - A description of the year around processing operation with some of its special features in addition to its obvious advantages, such as increased volume, reduced upkeep on idle plant, offering workers more than seasonal employment. The plant's ingenuity in freezing methods and equipment is discussed.

E. M. F.

(181) Anon., "Fruit Growers Association Diverts Refrigerated Warehouses to Quick Freezing." Ice & Refrig. 104, No. 6, 329-31 (1943).

(182) Anon., "Good Bookkeeping Necessary for Successful Locker Operation." Ice & Refrig. 105, No. 1, 35 (1943).

(183) Anon., "Standards Are Issued on Mineral Wool for Low Temperature Installations." Ice & Refrig. 105, No. 1, 37-9 (1943). - Standards of materials and construction given by National Bureau of Standards in collaboration with Industrial Mineral Wool Institute.

E. B.

(184) Anon., "Report on 1942 Production of Fruits & Vegetables." Ice & Refrig. 105, No. 2, 81-2 (1943). - Statistics show volumes of food frozen in 1942 and general development of industry in past two decades.

E. B.

(185) Anon., "Frozen Fruit Purees Open New Market for Frozen Fruits." Ice & Refrig. 105, No. 3, 125-6 (1943). - H. J. Loeffler has produced a frozen dessert with the texture and consistency of ice cream by using fruit puree, gelatin, and sugar. Formula for frozen fruit dessert is given. Information pertaining to preparation, packaging and freezing pureed fruit is included.

W. B. C.

(186) Anon., "Prestige & Good Service Builds Thriving Locker Business." Ice & Refrig. 105, No. 4, 189 (1943).

(187) Anon., "Cooling Blanched Frozen Foods." Ice & Refrig. 105, No. 5, 239 (1943). - Points made in this article are that (1) air-cooling of blanched fruits in certain areas is possible and desirable and methods are suggested, and (2) independent conveyor belts for blanching and cooling of vegetables in commercial plants would greatly increase quantity and quality of processed material.

E. M. F.

(188) Anon., "Quick-Freezing in Post War World." Modern Refrig. 46, No.

544, 149-52 (1943). - Special reference made to modern plant in Ulster handling many rapidly frozen products; advantages of quick-freezing, utilizing by-products; shipment.

E. I. 1943, 896.

(189) Anon., "Directory of Equipment Needed by Frozen Food Packers and Dehydrators." Quick Frozen Foods 5, No. 6, 19-24 (1943). - Containers and packaging materials, packaging machinery, temperature regulators, dehydrating equipment, vegetable seeds from better varieties for freezing, insulating materials, quick freezing equipment, processing equipment: all are cataloged according to company or producer and its location.

F. F.

(190) Anon., "Cold Storage Plant Modernized." Refrig. Eng. 45, No. 6, 416 & 468 (1943). - Method of converting 32° F. storage space for use of 0° F. described.

E. B.

(191) Anon. Velva Fruit - A New Frozen Fruit Dessert. U.S. Dept. of Agriculture, Bureau of Agricultural and Industrial Chemistry, Western Regional Research Laboratory Mimeographed Circular A.I.C. 40, 1944. - For abstract see 1026.

(192) Anon. Home Preparation of Velva Fruit - A New Frozen Dessert. U.S. Dept. of Agriculture, Bureau of Agricultural and Industrial Chemistry, Western Regional Research Laboratory Mimeographed Circular A.I.C. 53, 1944. - Cf. Western Frozen Foods 5, No. 12, 3-4 (1944); Blue Anchor 21, No. 4, 22-4 (1944).

F.F.

(193) Anon. Commercial Preparation and Freezing Preservation of Sliced Apples. U.S. Dept. of Agriculture, Bureau of Agricultural and Industrial Chemistry, Western Regional Research Laboratory Mimeographed Circular A.I.C. 57, 1944. 7 pages. - A prefreezing treatment is necessary to prevent the normal darkening that occurs in apple slices subsequent to defrosting. This darkening is due to enzymic oxidation and can be prevented by immersion of the slices in a solution of sulfurous acid or $NaHSO_3$ or by scalding them in steam. Laboratory studies indicate that dipping in $NaHSO_3$ is superior to the other treatments.

C.A. 38, 5996 (1944).

(194) Anon. Factors That Affect Quality in the Freezing Preservation of Peas. U.S. Dept. of Agriculture, Bureau of Agricultural and Industrial Chemistry, Western Regional Research Laboratory Mimeographed Circular A.I.C. 66, 1944. - Cf. Canner 100, No. 16, 17-18, 42 (1945); Food Packer 26, No. 5, 68, 70 (1945); Western Frozen Foods 6, No. 5, 8-10, 12-13 (1945).

F.F.

(195) Anon. How To Prepare Vegetables and Fruits for Freezing. U.S. Dept. of Agriculture, Bureau of Agricultural and Industrial Chemistry, Printed Circular A.W.I. 100, 1944.

(196) Anon., "Frozen Food Packs - United States (Statistics 1942-44)." Canning Trade 67, No. 38, 22 (1944).

(197) Anon., "Recommendations for Locker Plants." Cornell U. Locker Operator 5, No. 7, 12-13 & 44-46 (1944).

(198) Anon., "Frozen Tomatoes Not Too Good, Juice Has Possibilities." Food Ind. 16, No. 8, 632-3 (1944). - Results of tests made at Dept. of Agriculture's Western Regional Research Laboratory, Albany, Calif., with reference to possibility of preserving tomatoes and tomato juice by freezing; designed to aid in development of satisfactory methods; frozen juice has good color and pleasant flavor, but tomato sections collapse on thawing.
E. I. 1944, 889.

(199) Anon., "Sulphur Dip Prevents Browning of Frozen Sliced Apples." Food Ind. 16, No. 10, 805-6 (1944). - Sliced apples for pies can be frozen without browning when right pretreatment is used; details of solutions and equipment recommended by Western Regional Research Laboratory are presented. Bibliography.
E. I. 1944, 890.

(200) Anon., "New Fruit Packing Plant Specializes on Quick Frozen Apples." Ice & Refrig. 106, No. 6, 23-4 (1944). - Details of Frick freezing system installed in plant of C. H. Musselman Co. for freezing fresh fruits in season; freezing tunnel described, which has five Lau blowers, of squirrel cage type, on each side of tunnel; $13\frac{1}{4}$ by 9 booster compressor with V-belt drive operates at 400 r.p.m.
E. I. 1944, 890.

(201) Anon., "Home Freezing Units." Ice & Refrig. 106, No. 4, 207-10 (1944).

(202) Anon., "Procedure in Freezing Fruits and Vegetables." Locker Operator 5, No. 9, 33-5 (1944).

(203) Anon., "Quality of Frozen Peas." Mod. Refrig. 47, No. 557, 197-8 (1944). - Methods for maintaining high standard in processing. Information received at Institute Headquarters of Inst. Refrig. Supplement, from Western Regional Research Laboratory, Albany, Calif., Bureau of Agric. and Indus. Chem., Agric. Research Administration, U. S. Dept. of Agriculture.
E. I. 1944, 889.

(204) Anon., "Quick Freezing Herring. Large Scale Plant Tests." Mod. Refrig. 47, No. 558, 214-5 , 236 (1944). - Brief commentary on two experimental plants for quick freezing of herring, and one experimental plant for dehydration operating at Aberdeen; blast freezing process described; illustration given.
E. I. 1944, 889.

(205) Anon., "Tentative U. S. Standards for Grades of Frozen Strawberries."

Quick Frozen Foods 6, No. 12, 29 (1944). - Effective July 1, 1944, and superseding standards of Sept. 1, 1942, the standards cover three grades - U. S. A or Fancy, B or Choice, and Substandard. Three sizes are recognized - small, or less than 5/8 inch in diameter; medium, or 5/8 inch to $1\frac{1}{4}$ inch; large, or greater than $1\frac{1}{4}$ inch. Maximum points are: color, 40; absence of defects, 40; character of fruit, 20. To be rated A, fruit must score at least 34 points each for the color and absence of defects categories, and 17 points in character of fruit. A B rating is given fruit scoring from 28 to 33 and from 14 to 16 in the categories mentioned. Fruit failing to meet B standard in any category is rated substandard regardless of total score. Specific rules for scoring are given, e.g., under absence of defects, a sample to classify A must contain no stem and leaves, and not more than 5 sepal-like bracts per 16 ozs. or 1 full cap per 48 ozs., and not more than 5% damaged fruit. For B grade, the tolerances are 1 piece of stem or leaf, and 10 sepal-like bracts, or 2 caps, and 10% damaged fruits. Points awarded decrease as maximum tolerances are approached.

B. A. 19, 157 (1945).

(206) Anon., "University of Maryland Conducts Frozen Food Conference June 2." Refrig. Eng. 48, 24, 66, 68 (July, 1944). - The selection and handling of fruits, vegetables, meat and poultry for storage in refrigerated lockers was thoroughly discussed at a Frozen Food Conference at the University of Maryland.

E. M. F.

(207) Anon., "New Fast Freezer in Operation for Vegetable and Poultry Produce." Refrig. Eng. 48, 536 (Dec., 1944). - A description of a new fast freezer which delivers 6,000 pounds of fresh produce an hour. It is now at work in the food-processing plant of John S. Isaacs & Sons and will be used to quick freeze annually more than a million and a half pounds of Lima beans alone. One of the unique features of the freezer is its rapid defrosting equipment. The design also makes it possible to incorporate two or more machines into a single unit to provide a parallel production line for freezing both loose and packaged products at the same time.

E. M. F.

(208) Anon., "G. E. Sponsors Food Freezing Conference." Sales Management 53, 104 (1944). - Discussion of topics presented at the conference of a means for educating the consumer public in the fundamentals of this new method of food preservation; in addition reports were given on experiments with home freezers.

E. M. F.

(209) Anon., "A Test for Adequacy of Blanching in Frozen Vegetables." Western Frozen Foods 5, No. 4, 7 (1944). - This test for adequacy of blanching of frozen vegetables is based on a determination of the peroxidase activity by a method that has given good correlation with the keeping quality of certain frozen vegetables held in freezing storage for four years. It is known to be applicable to peas, snap beans, Lima beans, asparagus and cut corn. Grind 10 grams of the tissue to be tested (previously cut into small pieces) in a mortar with sand and a little water for 3 minutes, mix with enough additional water to make 30 cubic centimeters, filter through a cotton milk filter, dilute 2 cubic centimeters of the filtrate with 20 cubic centimeters of H_2O. Add carefully 1 cubic centimeter 0.5% guaiacol solution and 1 cubic centimeter of 0.08% H_2O_2 without mixing and then mix

thoroughly after both have been added. If no color develops within 3.5 minutes the product may be considered adequately blanched even though color develops later. If the test is positive the color development will be of sufficient intensity to be recognizable.

C. A. 38, 2409 (1944).

(210) Anon., 1945-46 Directory of Frozen Food Processors. New York: E. W. Williams Publs., 1945.

(211) Anon., Frozen Foods - How to Prepare, Package, Freeze, Cook. Bridgeport, Conn.: General Electric Consumers Institute, 1945.

(212) Anon., Frozen Foods Facts. Memphis, Tenn.: Vitafreeze, Inc., 1945.

(213) Anon. Frozen Food Industries, Plant Layout, Cost of Processing, Marketing. University of Arkansas Information Series No. 1, 1945, (revised May 15, 1946 as volume 40, number 10). - Flow charts for processing fruits, vegetables and poultry and directions for processing. Discussion of quality, plant investments, costs, marketing, etc.

F. F.

(214) Anon. Drawings and Plans for Farm Freezers. University of California Agriculture Extension Service, 1945.

(215) Anon., "Complete Dinner Prepared in 15 Minutes in New Food Preparation System." Am. Gas Assn. Mo. 27, 399 (1945).

(216) Anon., "Frosty - Edge Issue." Business Week, p. 68 (April 14, 1945). - Public financing makes its bow in frozen foods distribution with offering of shares of stock by Freezer Foods, Inc.

F. F.

(217) Anon., "Speed of Freezing Vegetables Studied." Canadian Food Packer 16, No. 10, 37 (1945).

(218) Anon., "W.F.A. Grade Standards for Frozen Lima Beans." Canner 100, No. 17, 16, 20, 30 (1945). - War Food Administration sets standards for frozen Lima beans. Grades A, B, C, and D. Grade A: score of 90; B, 80; C, 70; and D, below 70. A and B must be tender and of normal flavor and odor, C must be fairly tender and of normal flavor and odor. Scoring is on basis of color uniformity and absence of defects. Grade C is U. S. Standard.

F. F.

(219) Anon., "W.F.A. Tentative Standards for U. S. Grades of Frozen Peas." Canner 100, No. 19, 18, 32 (1945). - Graded on color, absence of defects, and tenderness and maturity plus possession of normal flavor and odor. Grades A, B, C, D with C being U. S. Standard.

F. F.

(220) Anon., "The Preparation and Freezing Preservation of Sliced Apples." Canner 100, No. 19, 20, 22, 24, 36 (1945). - Apples peeled, cored, sliced and then treated to prevent normal darkening. This is done by dipping in either sulfurous acid or sodium bisulfite, or by scalding in steam. Dipping in sodium bisulfite proved superior: 2,000 ppm of SO_2 is minimum safe concentration in a bath for a 1-minute dip. Testing for thoroughness of penetration may be carried out by "cutting slices in two and putting a few drops of a 1% catechol solution on the cut surfaces." Darkening in a short time is evidence of incomplete penetration of the protective solution. Directions are given for preparing the SO_2 dipping bath and subsequent testing and maintenance of its strength. Packaging and freezing are mentioned. Freezing and storage temperatures should be kept at 0° F. or below.

F. F.

(221) Anon., "Frozen Packs Registered Big Gains in 1944." Canner 100, No. 20, 15 (1945). - Total pack of frozen fruits and berries in 1944 showed tremendous increase and resulted from expansion of frozen apples, applesauce, apricots, R.C.P. cherries, and peaches. The West showed largest gain of any section. Total gain of vegetable pack was smaller but there was some increase and again the western states showed the largest gain.

F. F.

(222) Anon., "U. S. Standards for Grades of Frozen Brussels Sprouts." Canner 101, No. 4, 13, 24, 26 (1945). - Definition, grades, count and size of frozen Brussels sprouts. Ascertaining the grade dependent upon color, absence of defects, and character as well as normal flavor and odor.

F. F.

(223) Anon., "New Type of Frozen Food Package Ready for Trial." Canner 101, No. 5, 12 (1945). - New fiberboard and tin package for frozen foods produced by American Can Co. Requires no inner liner, eliminates the setting-up process at food plant, and may be printed at point of manufacture eliminating labeling process; in addition its manufacturer claims it to be more resistant to transfer of moisture-vapor and to water leakage. Foods in sirups may be thawed in the cans without leakage or possible discoloration through oxidation.

F. F.

(224) Anon., "Tentative U. S. Standards for Frozen Peaches." Canner 101, No. 6, 18, 20, 24, 34 (1945). - Definition, types, styles and grades of frozen peaches. System for marking sugar or sugar sirup in pack. Ascertaining grade dependent upon color, uniformity of size and symmetry, absence of defects, and character of fruit, as well as normal flavor and odor.

F. F.

(225) Anon., "Tentative U. S. Standards for Frozen Apples." Canner 101, No. 12, 36, 38 (1945). - Definition, styles, and grades of frozen apples. How to ascertain rating on basis of color, uniformity of size, absence of defects and character of fruit in addition to normal flavor and odor.

F. F.

(226) Anon., "Postwar Outlook for the Frozen Food Industry." Canner 101, No. 14, 18, 36 (1945). - Postwar period will see introduction of new frozen foods and others which have not been packed during the war such as coconut, grapefruit sections, pineapple, etc. There will be more materials for construction, supplies for packing such as sugar. Price controls will continue. Refrigerated car shortage will be eased. There will be no immediate cut-back in Army demands.

F. F.

(227) Anon., "Let the Housewife See." Canner 101, No. 24, 18, 20 (1945). - New developments in packaging of frozen foods by Sylvania Industrial Corporation: (1) Window package; (2) frozen dinner package containing entire meal for four - typical package contains peas, corned beef hash, and peaches; (3) shrinkable, transparent seamless tubing for poultry and irregular cuts of meat - tubing shrinks preventing inside air from absorbing moisture from the food.

F. F.

(228) Anon., "Packaging Frozen Foods - A Job for Machines, Not People." Canner 101, No. 24, 24 (1945). - Machinery has been developed to package free-flowing frozen foods by Hoopeston, Ill., plant of Sprague Sell Division of Food Machinery Corporation.

F. F.

(229) Anon., "Defrosting Frozen Food for Bakeries." Electronics 18, 154 (June, 1945). - Dielectric heating used by A&P Food Stores in high speed defrosting of frozen foods in bulk. Thirty pound cartons of solidly frozen peaches normally require 20 hours to defrost safely, but were thawed in less than 15 minutes with Megatherm equipment. Method uses an oven whose floor and ceiling are insulated metal plates which are connected to a high frequency generator. Frozen food placed between the plates and subjected to dielectric heating is uniformly defrosted. Firmness and texture of tree-matured fruits and vine fresh berries are retained after defrosting by this method. Various details are given.

W. B. C.

(230) Anon., "Strawberry Crop Problems Solved by Barge Freezing." Frosted Food Field 1, No. 5, 1-2 (1945).

(231) Anon., "Processing Frozen Peaches and Apricots With Ascorbic Acid." Food Packer 26, No. 12, 38-40 (1945). - "Prefreezing treatment of the cut fruit with ascorbic acid provides a means of delaying the onset of discolcration and its associated undesirable flavor change after the frozen fruit is thawed. The method ... of surrounding the cut fruit prior to freezing with a sugar solution containing added pure crystalline ascorbic acid as a means of retarding the enzyme-catalyzed oxidative changes" is described.

B. J. W.

(232) Anon., "West Leads Frozen Food Advances in Production." Good Packaging 6, No. 5, 30-1, 44 (1945).

(233) Anon., "Frozen Food Output in Northwest for 1944 Has Record Total of Nearly 200 Million Pounds." Ice & Refrig. 108, No. 4, 56 (1945). - Statistics showing large increase in frozen pack fruits and vegetables in 1944.
F. F.

(234) Anon., "Refrigerated Storage of Frozen Foods." Ice & Refrig. 109, No. 5, 34-5 (1945).

(235) Anon., "Frozen, Cooked, and Eaten in the Package." Mod. Pkging. 18, 102-3 (1945).

(236) Anon., "Industry Forecast of Immediate Equipment Needs, Including the Annual 1945 Equipment Directory." Quick Frozen Foods 7, No. 8, 51-62 (1945). - Results of a national survey in the fields of commercial frozen food packing, locker plants, and distributors. The survey did not include postwar needs but, instead, dealt with immediate, unfilled needs. The equipment directory lists producers and their products under various equipment and supply headings.
B. H. W.

(237) Anon., "The 1945 Quick Frozen Foods Production Map." Quick Frozen Foods 7, No. 9, 42-5 (1945).

(238) Anon., "Foods Which Have Been Frozen." Quick Frozen Foods 7, No. 9, 50, 52 (1945). - Many foods including vegetables, fruits, and berries, poultry, game, fish and fish fillets, fruit juices, purees, pulps both raw and cooked and various prepared foods and combinations are either being frozen commercially or have shown promise under experimental conditions.
B. A. 19, 2019 (1945).

(239) Anon., "New Defroster Developed." Quick Frozen Foods 7, No. 10, 36-37 (1945); Canner 100, No. 24, 12-13 (1945); Food Packer 26, No. 7, 48-49 (1945). - Description of use of electronic (high frequency) defroster for frozen foods developed by Federal Telephone and Radio Corporation. Experiments were conducted by William Cathcart and H. W. Gilb of the A&P. Solidly frozen 30-pound cartons of fully ripened peaches require less than 15 minutes of electron defrosting ("Megatherm high frequency method"), compared with 20 hours required at room temperature. Frozen food is placed between insulated metal plates and subjected to dielectric heating, which results in uniform heating. No chemical breakdown results in the short period required. Cooking is possible, if desired, by leaving the foods in the oven after defrosting.
B. H. W.

(240) Anon., "Latest Research in Refrigeration." Quick Frozen Foods 7, No. 10, 40 (1945). - Condensation of a bulletin issued by the Refrigeration Research Foundation. Freezing of fruit juice is being studied by G. L. Marsh at the University of California. Dr. Gladys Vail at Kansas State College is studying the effect of methods of handling frozen meats on nutritional quality and palatability of the cooked product. Dr. Leonora A. Hohl at the University of California has reported on the storage of frozen coconut. An uncooked, cold-processed, jelled and frozen fruit has been de-

veloped at Western Regional Laboratory. H. C. Diehl of the Foundation has reported inquires on the spoilage of frozen foods, especially peas and spinach, after storage for some time; factors are discussed, these being chiefly, delays in handling prior to freezing and incomplete freezing.

B. H. W.

(241) Anon., "Frozen Food Packaging for the Home." Quick Frozen Foods 7, No. 10, 44-45 (1945). - A discussion, with examples and sources of combination packages now on the market.

B. H. W.

(242) Anon., "Some Recent Frozen Food Packages." Quick Frozen Foods 7, No. 10, 50-52 (1945). - Pictures of numerous commercial packages.

B. H. W.

(243) Anon., "1944 Production of Frozen Foods." Quick Frozen Foods 7, No. 11, 51 (1945). - Statistics on 1944 (and 1942 and 1943) production of frozen foods, compiled by the National Association of Frozen Food Packers. The total fruit pack in 1944 amounted to 322,637,534 pounds, while the total vegetable pack amounted to 234,335,634 pounds.

B. H. W.

(244) Anon., "Experiments in Freezing Tropical Fruits." Quick Frozen Foods 7, No. 12, 52-53 (1945). - Report on experiments conducted at the University of Hawaii's Agricultural Experiment Station, under direction of Dr. Robert C. Linder, on quick freezing of mangoes (sliced), pineapple (whole and sliced), litchi, papaya, Surinam cherry, etc. None of the fruits will be as cheap as the standard frozen items, but little difficulty has been encountered in their quality freezing by standard methods. Descriptions of the particular qualities of each fruit are included.

B. H. W.

(245) Anon., "The Story of the Frozen Foods Industry." Quick Frozen Foods 8, No. 1, 99-104 (1945). - Discussion of the development of commercial quick freezing from the appearance of the first frozen foods in 1930; today the industry has grown to the point that there are between 450 to 500 frozen food processors processing all types of foods - fruits, vegetables, seafoods, meats, poultry. In terms of pounds of output the industry has also grown rapidly - from 150,000,000 pounds of fruits and vegetables in 1937 to an estimated 700,000,000 to 800,000,000 pounds in 1945. There are between 35,000 and 40,000 stores retailing these products and the retail sales volume for frozen foods is $200,000,000 per year as compared to the total retail volume in perishable foods of $17,000,000,000. The outlook for the industry is good with expansion expected in all parts. The freezing of cooked foods shows good possibilities. The number of locker plants has increased from 1,269 in 1938 to approximately 5,600 in 1945 - the average initial investment for one of these plants is about $5,000.

B. J. W.

(246) Anon., "The Production of Frozen Orange Juice." Quick Frozen Foods 8, No. 2, 55, 105 (1945). - Frozen condensed orange juice which compares favorably with fresh juice prepared by Knight & Middleton, Inc., of Clearwater, Fla. Juice is concentrated 4 to 1. Process is that of Dr. A. L.

Stahl: juice squeezed carefully to avoid tissue and rind substances; strained; run into vacuum where air is removed; juice sprayed on freezer drum so that it freezes in flakes; ice flakes or "slush" centrifuged, this shakes off concentrated solids leaving only frozen water which is discarded.

F. F.

(247) Anon., "Eviscerated Poultry Being Used by the United States Army." Quick Frozen Foods 8, No. 3, 13, 39-40 (1945). - Increase in use of poultry by U.S. Army due to introduction of frozen eviscerated poultry - a product ready to cook without need for cleaning and drawing.

F. F.

(248) Anon., "Fibre Packages Lead U. S. Frozen Fruit and Vegetable Packs Today." Western Canner & Packer 37, No. 2, 47, 49, 52, 53 (Feb., 1945). - Survey and tables of packaging according to three types: barrel, tin, fibre. Fibre leads in usage. Market for frozen foods shows that the manufacturer is the chief user with retail trade, second and institutional buyers, third.

F. F.

(249) Anon., "California Frozen Food Packs Gain 50% in Record 1944 Season Production." Western Canner & Packer 37, No. 3, 49 (Mar., 1945). - Statistics and discussion of 1944 production of frozen foods in California showing a 50% overall rise over 1943 - with vegetable production showing a slight rise. Big gain was in fruits with frozen apricots accounting for 78% of entire fruit pack. Figures for California varieted distribution vary widely from the national pattern.

F. F.

(250) Anon., "Northwest 1944 Frozen Food Output Hits Record Total of Nearly 200 Million Lbs." Western Canner & Packer 37, No. 3, 55, 57 (Mar., 1945). - Statistical charts explained - show total higher than in previous decline, but vegetable pack shows slight decline.

F. F.

(251) Anon., "WRRL Tests Cooling Peas With Ice-Salt Mixture to Reduce Splitting of Skins." Western Canner & Packer 37, No. 6, 27 (May, 1945). - In cooling peas, prior to freezing, use of salt added to the ice will reduce markedly the splitting of pea skins. This will increase the grading of peas since not more than 12% of peas showing split skins are permissible in Grade A packs. Work done at Western Regional Research Laboratory, Albany, California.

F. F.

(252) Anon., "Bazooka Freezer Will Be Used at Sumner in 1945." Western Canner & Packer 37, No. 6, 47-8 (May, 1945). - Discussion, photograph, and blueprint of Bazooka Freezer at Associated Frozen Food Packers, Sumner, Washington. Operates on principle of contact freezing. Advantages are: (1) unit is self contained and thus needs no refrigerated room for operation, (2) simple to install, (3) occupies little space, (4) is easily cleaned, and (5) adaptable to a wide range of uses.

F. F.

(253) Anon., "U. S. Frozen Fruit Pack Up One-Third." Western Canner & Packer 37, No. 6, 49 (May, 1945). - Comparison of total yields in 1943 and 1944 shows that the 1944 output of frozen fruit was up one-third over the 1943 output. A breakdown is given by types of fruits. The vegetable output was equal. Western states packed most of U. S. output.

F. F.

(254) Anon., "California Frozen Fruit Pack By Sizes." Western Canner & Packer 37, No. 7, 56-7 (June, 1945). - Correction in figures released earlier in 1945 shows some four million pounds more of fruits than was previously reported. Majority of 1944 output was in large sizes for manufacturers, but small packages gained over 1943.

F. F.

(255) Anon., "Northwest Frozen Packers Stress Quality at Meeting." Western Canner & Packer 38, No. 1, 47-51, 98 (Jan., 1946). - Report of annual convention. Subjects discussed: quality, harvesting costs, laboratory projects, color maintenance and vitamin C, electron defroster, consumer demand, grade standards of fruits and vegetables, transportation problems, labeling needs according to needs for each product, sanitation.

F. F.

(256) Anon., "Packers Determine Postwar Trends in Frozen Packaging." Western Canner & Packer 38, No. 1, 61 (Jan., 1946). - Fibre packages used almost exclusively for frozen vegetables. Statistics show rise in use of fibre packages to 76% in 1944. But survey indicates a return to cans for fruit institutional packs in West; consumer packages will continue to be made of fibre.

F. F.

(257) Anon., "New Frozen Pack Plants Progress in the Northwest." Western Canner & Packer 38, No. 1, 64 (Jan., 1946). - First floating fruit and vegetable freezer of commercial size (in Alaska). Also reports on three other major plants being set up in Northwest. New improvements and expansions of some existing plants.

F. F.

(258) Anon., "Frozen Apples Packed Speedily by Epperson." Western Canner & Packer 38, 67-9 & 88 (Mar., 1946). - Plant described for freezing sliced apples for subsequent use in cooking. Blanching is proper method to prevent the apple product from discoloring upon thawing out.

F. F.

(259) Anon., "Calif. 1945 Frozen Fruit and Vegetable Pack 215 Millions." Western Canner & Packer 38, 48-9 (Apr., 1946). - Large gain over 1945. Statistics and tables.

F. F.

(260) Abrams, A. and Chilson, W. A., "Vapor Transmission Through Papers." Paper Trade Journal 91, 175-180 (1930). - Vapor transmission through papers is largely dependent on the vapor pressure differential on the two sides of the sheet. Water vapor transmission is therefore largely affect-

ed by temperature and humidity, although other factors investigated have a minor influence on this rate. A suggested tenative method is to expose the paper to vapor at a fixed temperature and with a definite vapor pressure differential, the loss in weight over a certain period being computed to grams per 100 square inch per 24 hours. Homogeneous papers have vapor transmission rates generally proportional to their water penetration qualities but this relation does not hold for heterogeneous papers. The rate of passage of air through papers appears to bear no direct relation to the passage of water vapor through the same sheets.

E. M. F.

(261) Abrams, A., "Protective Wrapping - I and II." Mod. Pkging. 5, No. 5 & No. 6 (1932).

(262) Accoli, V. and Silvestri, S., "Researches on Frozen Meat." Arch. Form Sper. 14, 229-44. - Meat undergoes slight changes while frozen. These consist in increase of soluble protein, the development of a peculiar flavor and decrease in the aromatic odor of the broth.

C. A. 7, 658 (1913).

(263) Ackermann, "Cooperation of Packaging and Frozen Food Industries." Zeit Fuer Die Gesamte Kaelte - Industrie 47, No. 11, 174-6 (1940). - Cooperation of packaging and frozen food industries; requirements of packaging materials for frozen food products discussed.

E. I. 1941, 866.

(264) Acklin, O., "The Keeping Qualities of Sausage Made from Frozen Meat." Z. Untersuch Lebenson 55, 31-44 (1928). - Comparative experiments were made on the keeping qualities of sausage made from frozen meat and from fresh meat, the sausage being stored at an average temperature of 15° and average humidity of 60%. Tests of O_2 consumption, methylene blue reduction, condition of the sausage fat, etc., yielded no fundamental differences.

C. A. 22, 2013 (1928).

(265) Adam, W. B. and Horner, G., "The Effect of Blanching on the Nutritive Value of Canned Vegetables. I. Chemical Changes." Ann. Rept. Fruit & Veg. Preserv. Res. Sta. 1941, 21-31 (1942). - The practical conclusions reached from tests with peas, broad, stringless and runner beans, carrots, potatoes, parsnips, sprouts, swedes, dried peas and dried beans are that blanching is desirable in some cases (and may be safer in all) on account of improved flavor, but that this effect is achieved by blanching for not more than one or two minutes. Blanching in steam results in better retention of nutritive constituents than in water and gives a final product of about equal quality. The economic substitution of steam for water blanching for 2 - 3 minutes seems doubtful. 2 - 5 minutes should be regarded as a normal maximum time for bleaching, the first essential in wartime being the preservation of maximum nutritive value.

B. A. 18, 1010 (1944).

(266) Adam, W. B. and Stanworth, J., "Physical Changes Occurring During the Blanching of Vegetables." Ann. Rept. Fruit & Veg. Pres. Res. Sta. (Campden) 1941, 32-41 (1942). - Conclusions drawn from trials at Chipping Campden are as follows: (1) Blanching generally causes a reduction in weight of

vegetables, (2) It causes a sharp increase in specific weight, which means a considerable shrinkage in volume due to expulsion of gases and collapse of tissues, (3) It causes a sudden shrinkage in the volume of most vegetables, potatoes, soaked peas and soaked beans being exceptions, (4) Unblanched vegetables can be packed without serious risk of excessive pressures developing during processing, provided the cans are exhausted and closed at a high temperature, (5) Cans of unblanched vegetables show appreciably larger head spaces than cans of blanched vegetables, (6) The vacuum is greater in cans of blanched vegetables but the increase of vacuum produced by blanching is of little practical significance, (7) Most vegetables increase in weight during processing but this increase is much less in unblanched than in blanched material. Hence, if cans of unblanched and blanched vegetables are packed to equal capacity, the effect of the lower filled weight of the unblanched material and its added shrinkage during cooking will be to reduce the drained weight of the unblanched vegetables to about 85-90% of that of the blanched vegetables. This is much the most important physical advantage produced by blanching and involves a considerable saving in tin plate and bulk. Five minutes should not be exceeded for the blanching process except in the case of large tough roots which may need longer treatment to enable them to be subsequently sliced or diced.

B. A. 18, 1011 (1944).

(267) Adam, W. B., Horner, G., and Stanworth, J., "Changes Occurring During the Blanching of Vegetables." Jour. Soc. Chem. Indust. 1942 61, 96-99 (1942). - Losses of nutritive substances during blanching with water and steam for different lengths of time increased with the surface area per unit weight of the vegetables. Sugar, mineral matter, protein, and vitamin C were all affected in the same way. Blanching reduced the weight and volume of the vegetables and increased the weight which can be filled into the can. In some cases the flavour is improved; blanching reduces the pressures developed in cans during processing. All the desirable effects are produced within the first two minutes of the blanching period, which should be as short as possible.

E. M. F.

(268) Adams, A., "Eutectic Salt Ice." Refrig. Eng. 38, 279-82 (1939). - Eutectic salt ice is a solid refrigerant produced through the quick freezing of eutectic NACl brine. The freezing is accomplished by the "Flakice" machine. Eutectic salt ice is suitable for the refrigeration of frozen food in connection with the following: railroad cars, truck bodies, ice cream cabinets, and food display cases.

C. A. 34, 5200 (1940).

(269) Adams, G. and Smith, S. L. Experiment Station Research on the Vitamin Content and the Preservation of Foods. U. S. Dept. Agric. Mis. Publ. 536, 1944. 88 pages. - A report is given on variations in the nutritive value of foods due to natural variation, common storage, freezing and frozen storage, dehydration, brining and salting, canning, cooking, and milling, and on the preservation of foods by freezing, dehydration, canning, and other methods; 167 references.

B. A. 19, 38 (1945).

(270) Adams, J. R., "Lockers as Related to Frozen Foods Industry." Refrig. Eng. 41, No. 1, 24-30 (1941). - Whether ice industry believes in them or

not, lockers are being publicized, constructed, accepted by the public and the refrigeration industry should therefore give them serious thought; history of locker plants; how lockers will fit into picture of merchandising and distributing quick frozen foods during next few years; refrigeration engineers should provide accurate information to those who want to get into locker business. Before Am. Soc. Refrig. Engrs.

E. I. 1941, 262.

(271) Adriano, F. T., Valenzuela, A., and Miranda, L. G., "Studies on the Quick Freezing of Philippine Fruits and the Utilization of the Frozen Pack Products." Philippine J. Agr. 4, 41-72 (1933). - Strawberries, mangoes, avocados, lanzones, ates, guavas, young coconuts, pineapples, nangkas, lamasos, chicos and zapotes made frozen products of better flavor, color, and texture when frozen at 0° F. and -40° than those frozen at 18° F. Thirty-two references.

C. A. 28, 2425 (1934).

(272) Aeight, "Composition of Frozen Meat." Lindustria Llatiera e Zootecnia 1913; Boll. Chim. Farm 53, 430 (1914). - A. analyzed portions of lamb and ram flesh which had been kept for 160 days at -17° and -7°. The modifications observed in the composition of this meat were of little consequence. The proportion of soluble substances was much greater in putrefied meat. Freezing caused the meat to lose 2 - 3% of H_2O; the amount of peptones was increased and the content of coagulable N was decreased. The degree of acidity and the nutritive value of the meat were not affected.

C. A. 9, 1810 (1915).

(273) Akatsuka, H., "The Biochemistry of Frozen Fish." J. Biochem. (Japan) 7, 27-39 (1927). - Practically no change has been found in the amount of total and residual N of the muscles of cold storage carp frozen at -1° C. to -3° C. or at -10° C. to -13° C. The creatine content of carp muscle decreased by 19% by freezing at -24° C. for 20 minutes but no further change occurred for at least 2 weeks.

C. A. 21, 2283 (1927).

(274) Alderman, D. C. and Newcombe, B., "Some Factors Influencing Quality of Dehydrated, Canned, and Frozen Beans." Fruit Prod. J. 23, No. 12, 365-8 (1944). - Green beans of the Stringless Greenpod variety were cut crosswise in pieces $1\frac{1}{4}$ inch and $\frac{1}{4}$ inch long, lengthwise in fourths, and processed by dehydration, canning, and freezing. After processing, they were divided into four lots. The first was reconstituted and tested for palatability and quality immediately, and the other three lots were stored and tested 1, 3, and 6 months. The judges scored the products as to desirability of color, consistency, flavor, and rehydration by indicating whether each of these factors was very good, good, fair, or poor. The experiment was replicated four times and was set up on a split plot design and data reduced by applying analysis of variance. The results thus analyzed showed that dehydrated shredded beans are not only superior to canned beans, but equal to those frozen. The dehydrated shredded beans were significantly superior to the dehydrated beans cut crosswise. The inability of these long cut and short cut beans to rehydrate, was largely responsible for their poor quality scores. The ratings accorded color & flavor of the canned beans were inferior to those of dried shreds and frozen beans. Dehydrated, canned, and frozen beans all decreased significantly in quality after 6 months' storage.

B. A. 19, 157 (1945).

(275) Alexander, L. M. and Clark, N. G. Shrinkage and Cooling Time of Rib Roasts of Beef of Different Grades as Influenced by Style of Cutting and Method of Roasting. U. S. Department of Agriculture Technical Bulletin 676, 1939.

(276) Allen, F. W. and Pentzer, W. T., "The Influence of Relative Humidity in Cold-Storage Rooms upon Transpiration and Mold Growth of Fruit." Ice & Refrig. 88, 401-4 (1935). - High relative humidities are necessary to prevent loss of moisture in fruit during storage. High humidities, however, may allow rapid mold growth with some fruits. Grapes are more susceptible to injury by mold on storage at high relative humidities than are pears.

C. A. 29, 5194 (1935).

(277) Allen, P. W., "Bacteria, the Friends and Foes of the Food Industry." Refrig. Eng. 36, 307-8, 342, 344 (1938). - General discussion of bacteria and their role and control in nature; bacteria in food preservation especially as controlled by canning and refrigeration, particularly quick freezing. In canning the bacteria are killed by heat; in treatment with cold some of the bacteria are killed, while many are preserved but their growth halted. Presented at 2nd Food Preservation Conference, Knoxville, Tenn., 1938.

F. F.

(278) Almy, L. H. and Field, E., "The Preservation of Fish Frozen in Chilled Brine." J. Ind. & Eng. Chem. 13, No. 10, 927-930 (1921). - Results of experiments on penetration of salt.

E. I. 1922, 537.

(279) Almy, L. H. and Field, E., "The Preservation of Fish Frozen in Chilled Brine." J. Indust. & Eng. Chem. 14, 203-6 (1922). - Discussion of studies made on freezing of fish in air and in 15% brine. Methods of freezing and testing are noted. Tests were made for physical and chemical changes and for bacterial decomposition.

F. F.

(280) Almy, L. H., Field, E., and Hill, H. R., "The Preservation of Fish in Ice." Am. Food J. 18, No. 1, 36-8 (1923). - The weight of the fish first increased then decreased, a net loss occuring in fish on the bottom layers. A loss of mineral and organic constituents during the longer storage periods was indicated, particularly in gutted fish. No change in present practice of gutting most species is recommended from the results.

C. A. 17, 1515 (1923).

(281) Anderson, G., "Frozen Meat." J. N. Zeal. Dept. Agr. 2, 278-9. - The real nutritive matter in fresh and frozen meat is almost identical.

C. A. 5, 3310 (1911).

(282) Anderson, J. W., "Science and the Cold Storage Industry." Nature 100, 455-6 (1918). - A discourse.

C. A. 12, 962 (1918).

(283) Antonov, M. V. and Svereva, T. A., "Vitamin C in Fresh and Frozen Berries." Kholodilnaya Prom. 18, No. 3, 76-8 (1940). - The vitamin C content of berries varies with the kind, climate, weather conditions and conditions of harvesting. The following vitamin contents are reported in milligram-%: black currants (I) 131.01 - 161.45, red currants (II) 30.8 and white currants (III) 40.7, strawberries (IV) 57.8 - 70.88, raspberries (V) 17.63 and cherries (VI) 19. Berries frozen at -27° C. and stored 6 - 8 months at -18° C. showed the following percentage (retention) in vitamin C: I 56.5 - 68.3, II 70.5, III 51.6, IV 48.8 - 60.6, V 59.6 - 72.9, VI 11.3. When the berries were frozen in a 50% sugar sirup, the vitamin C (retentions) were: I 66.6 - 72, IV 66.7, V 77.4 - 83.6, VI 40.6%. When the berries were frozen with 2 parts sugar the vitamin C (retentions) were: for II 80, III 61.1, IV 75.4, V 84.4%. The major part of the loss always occurred during the first two months of storage. The vitamin losses during thawing were: for I 2.8, II 6, III 10.5 and V 14.4% (calculated on the initial content). The vitamin loss for berries frozen in sirup was somewhat less when they were slowly thawed over a period of 24 hours at room temperature.

C.A. 36, 7167 (1942).
C.Z. I, 590 (1941).
C.A. 39, 1238 (1945).

(284) Antun, J. J., "Precautions Necessary When Storing Frozen Foods." Food Ind. 10, 319 (1938). - Precautions necessary for proper air flow in storage so that foods remain in good condition.

F. F.

(285) Antun, J. J., "Storage of Quick Frozen Foods." Refrig. Eng. 39, 235 (1940). - The author presented recommendations for storing quick frozen foods covering such factors as methods of handling in and out, temperature, piling, floor racks, dunnage, height of piles, and aisles for best results.

E. M. F.

(286) App, F., "Quick Freezing Offers Wartime Economies." Food Indust. 14, No. 8, 48-9, 108 (1942); M. Refrig. 45, No. 535, 174-5 (1942).

(287) Appleman, C. O. and Arthur, J. M., "Carbohydrate Metabolism in Green Sweet Corn During Storage at Different Temperatures." J. Agric. Res. 17, 137-152 (1919). - Method presented by which sugar loss from green sweet corn could be determined by comparing analyses from the same ear. Enzymic reduction led to reduction of loss of sugar. Respiration accounted for only a partial loss. Most was due to condensation of polysaccharides. Temperatures at which study was conducted ranged from 0° C. to 40° C.

F. F.

(288) Appleman, C. O. Some Chemical Aspects of Sweet Corn Drying. Md. Agr. Expt. Sta. Bulletin 267, 1924.

(289) Appleyard, A. and Hirst, F., "Experiments on the Production of English Fruit Juices and Syrups." Am. Rept. Agric. & Hort. St. Univ. Bristol, 145-149 (1927). - Different treatments of juices and fruits were tried. As a whole, raw juices were not good. Best results were obtained by adding sugar until the density of the syrup was 45 - 50° Balling. The best syrups were made from black currants, raspberries, and loganberries.

B. A. 4, 164 (1930).

(290) Aragone, L. A., "Vitamins in Frozen Grape Juice." Rev. Faculdad Agron. Univ. Rep. (Montevideo) 21, 77-94 (1940). - The vitamin content of grape juice is reviewed. The presence of ascorbic acid was demonstrated in a muscatel grape juice that had been expressed, bottled, immediately cooled in H_2O at 1° C., then refrigerated at -8° C. to -5° C. for 30 days. 14 references.

C. A. 37, 1521 (1943).

(291) Arenjo-Jones, R. W. The Preserving of Fruits and Vegetables by Freezing. Canadian Department of Agriculture Technical Bulletin 12, Publication 591.

(292) Arighi, A. L., Joslyn, M. A., and Marsh, G. L., "Enzyme Activity in Frozen Vegetables." Indus. & Eng. Chem. 28, No. 5, 595-8 (1936). - Blanching peas and spinach for two min. at 80 to 90° C. before freezing suggested as important factor in controlling enzyme activity; method described. Bibliography.

E. I. 1936, 955.

(293) Artyukh, I., "Changes in the Protein Fractions in Frozen Meat on Prolonged Storage." Mayasnaya Ind. 1, 25-6 (1940); Khim. Referat. Zhur. 6, 136 (1940). - Freezing at -25° C. and storing for 220 days at -25° C. and for 220 days at 10° C. (with 85 - 90% absolute humidity) has no effect on the quality of meat. The most important proteins of meat are neither denaturated nor decomposed. The insignificant decrease of peptone and residual N (in pork and lamb) has no effect on the quality of the frozen meat. The organoleptic constants of frozen meat do not differ in any way from those of fresh meat.

C. A. 36, 4923 (1942).

(294) Awbery, J. H. and Griffiths, E., "Thermal Properties of Meat." J. Soc. Chem. Ind. 52, 326T-8T (1933). - With the advent of the quick-freezing processes, data as to the thermal properties of meat at low temperatures have assumed considerable importance and the experiments carried out to determine the specific heat, the thermal conductivity, and the thermal diffusivity of fresh beef are described in this article.

E. M. F.

(295) Babbit, M., "Packaging Frozen Foods." Food Indust. 9, 130-1 (1937). - Packers of frozen foods need containers which are moisture-vapor-proof. Package in general use is one-piece cardboard container of 0.018 sulphite pulp paper board and is paraffin coated. Vegetable parchment bags are heat sealed. The package is overwrapped with waxed glassine.

F. F.

(296) Baehr, O., "Deterioration and Discoloration of Frozen Fish in Cold Storage." Zeit fuer Eis-u Kaelte-Industrie 27, No. 5, 3-5 (1934). - Discoloration of frozen fish in cold storage house; results of experiments show that bacteria are one of the main causes of red discoloration of frozen fish in cold storage plants.

E. I. 1934, 240.

(297) Baehr, O., "The Brine Freezing of Herring." Zeit fuer Eis-u Kaelte-Industries 28, No. 5, 5-6 (1935). - Brine freezing of herrings; notes taken from articles in British Periodical, "Fishing News".

E. I. 1935, 912.

(298) Bagnolesi, U., "Quantitative Chemical Determinations on Frozen Fish for the Purpose of Determining the Best Method of Thawing This Product." Ann. Igiene 50, 461-9 (1940). - Protein, fat, ash and water were determined on samples of previously frozen fish which had been thawed in different ways. Data are reported in tables. It was found that very rapid thawing gave the poorest product. Equally good results were obtained by moderately fast thawing and slow thawing. Very slow thawing also impaired the product.

C. Z. II, 3286-7 (1940); C. A. 36, 7166 (1942).

(299) Baker, C. T., "Refrigeration in Connection with Frozen Berries." Food Industries 2, No. 4, 180-1 (1930). - Plans are being considered for establishing suitable quick-freezing plant; experimental work conducted at Macon Ga.; refrigeration operates at experimental plant; quick-freezing of strawberries.

E. I. 1930, 1500.

(300) Baker, C.T., "Leveling Seasonal Oversupply by Freezing Georgia Peaches." Food Industries 2, No. 11, 496-8 (1930); South Power J. 48, 59-61 (Dec., 1930). - Operations in plant of T. Huston Frozen Foods, Inc., at Montezuma, Ga., refrigerating plant is electrically driven throughout and consists of combination of 80-ton ammonia and 45-ton carbon dioxide compressor connected to common crankshaft, with driving motor mounted on shaft between two compressors; plant designed to handle and freeze 40,000 lbs. of sliced peaches per day of twenty-four hours.

E. I. 1930, 1500.

(301) Baker, C. T., "Review of 1929." Refrig. 47, No. 1, 47-50 (1930). - Progress in freezing of food products outstanding refrigeration want of year; discussion of following subjects: ice plants, compressors; dry ice,

silica gel, automatic plant, refrigerating mediums, air conditions, fur storage, frozen products, and ice-cylinder method of preserving mills.

E. I. 1930, 1495.

(302) Baker, C. T., "Quick Freezing of Georgia Peaches." Ice and Refrig. 81, No. 6, 473-4 (1931). - Features of plant designed for freezing peaches; process of handling fruit; preparing fruit for freezer; packing in cartons and shipping. Before Nat. Assn. Practical Refrig. Engrs.

E. I. 1931, 1206.

(303) Baker, C. T., "Food Preservation in South." Heating, Piping and Air Conditioning 11, No 12, 775-7 (1939). - Preservation which involves control of temperature and humidity with special emphasis on preservation of food commodities in South, described; outline of methods employed, descriptions of typical refrigerating equipment and of plants for quick freezing of vegetables, fish, and storage of pecans - Before Am. Soc. Heating and Vent. Engrs.

E. I. 1939, 1005

(304) Baker, C. T., "What is Ahead for Frozen Food Industry in Southeast." Refrig. Eng. 37, 98-9 (1939). - Discussion of economic waste and prediction that it will disappear, discussions of new development in quick freezing of lima beans, future of frozen sea-foods industry in south, and introduction of newer and better methods of freezer locker storage.

F. F.

(305) Baker, G. L., "Pectin as an Aid in Freezing Fruits. I. Its Application in the Freezing Preservation of Strawberries." Food Industries 13, No. 1, 55-7 (1941). - Pectin can be used to form a pectin-sugar-juice syrup by combining with the sugar and such juices as may leak out of the fruits before actual freezing occurs. The added pectin also prevents oxidation and off flavors. Methoxyl content of the pectins used in the experiments varied from 3.5% to 11%. The pectin containing the lowest methoxyl content is a product approaching pectic acid or completely demethylated pectin. The value of low-methoxyl pectins as protective agents for frozen strawberries was established. The use of a cold 2% pectin of methoxyl content about 5%, reduced the loss of juice upon thawing by 33%. Treatment with the pectin solution at temperatures below 60° F. proved best. Pectins of high methoxyl content, including the commercial pectins, were of no value in reducing the loss of juice. An excess of metallic ion, over 0.05% in solution decreased the favorable effect of the salt solutions. In no instance did small amounts of $CaCl_2$ either by itself or in sequence with the low methoxyl pectin, equal in prefreezing value the use of pectin alone.

C. A. 36, 3571 (1942).

(306) Baker, G. L., "Pectin as an Aid in Freezing Fruits. II. Its Application in the Freezing Preservation of Peaches." Food Industries 13 No. 2, 56-97 (1941). - Cf. C. A. 35, 3730. Contradictory results were obtained with peaches; in general the white-fleshed varieties were improved but the yellow-fleshed varieties were not improved in quality as a result of low-methoxyl pectin addition. Pectins of high methoxyl content aid in the formation of viscous syrups when in combination with juice and sugar which cling to the exterior of the peach and thus prevent oxidat-

ion. High methoxyl pectin was a valuable addition in the pre-freezing of Elberta peaches. Tentative specification of a low methoxyl pectin for commercial trial in the freezing of strawberries are: a methoxyl content of 5 ± 1%, ease of water solution, relative viscosity (Ostwald or Capillary) above 10 in 0.5% solution at pH 3.0 - 3.5, a natural ash content of less than 4%, and no added buffer salts.

C. A. 36, 3571 (1942).

(307) Baker, J., "Frozen Foods, the Package in Their Future." Mod. Pkging 19, 102-4 (1945)

(308) Baker, L. N., "Experiences in Operation of Rural Community Locker Plants." Refrig. Eng. 42, No. 6, 375-80 (1941). - Summary report on series of experiments and demonstrations conducted by Tennessee Valley Authority in cooperation with Agricultural Extension Services in four of Tennessee Valley States in order to find out most suitable equipment, cost of construction and operation, economic and practical benefit to rural families and degree of acceptance and utilization of refrigeration as community service. Before Univ. of Tenn. Food Preservation Council.

E. I. 1941, 261

(309) Baldwin, W. H., "Keeping Quality of Frozen Fish." Ice and Refrig. 94, 98 (1938). - During long periods of storage, fish first become strongly acid, then as the storage time is extended the flesh becomes alkaline until at the end of several months ammonia gas is given off. When living fish are frozen, these chemical changes do not occur until the fish is defrosted, at which time they show rigor mortis and proceed through the usual acid alkaline cycle of changes associated with deterioration.

C. A. 32, 2237 (1938).

(310) Balls, A. K. and Hale, W. S., "Pineapple Juice Prevents Discoloration of Cut Fruits." Citrus Ind. 15, No. 9, 9 (1934).

(311) Balls, A. K. and Hale, W. S., "Peroxidase in the Darkening of Apples." Ind. Eng. Chem. 27, 335-7 (1935). - Darkening of freshly cut surfaces of apples, or of apple juice, is a reaction catalyzed by peroxidase. The inhibition of peroxidase therefore results in delaying this discoloration. Peroxidase inhibitors fall into two classes: (1) substances that affect the enzyme directly such as the sulfhydryl compounds (a derivative of which is found occuring in pineapple juice) and (2) of less important substances which accelerate enzyme inactivation by hydrogen peroxide. F. F.

(312) Balls, A. K. and Tucker, J. W., "Activity of Lipase at Low Temperatures." Indus. and Eng Chem. 30, No 4, 415-6 (1938). - Lipases are enzymes that attack large discrete particles of their substrates, for even in the finest emulsion; size of fat particles is enormous compared with any reasonable conception of the lipase molecule; results of investigation of lipase activity in frozen systems; reference made to previous work by Balls, A. K., Lustlack, M. B., and Tucker, I. W., published in J. Biol. Chem., 1937, dealing with work on lipase from pig pancreas.

E. I. 1938, 499

(313) Balls, A. K. and Kies, M. W., Effects of Freezing on Autolysis of Meat. Proc. 30th Ann. Mtg. Am. Indust. Refrig., 1941.

(314) Balls, A. K., "Fate of Enzymes in Processed Foods." Fruit Prod. J. 22, No. 2, 36-37 (1942). - Blanching is the practical method of applying heat to destroy enzymic activity; it must be relative thorough unless subsequent storage is very cold or very dry, and it must be sufficiently prolonged; long heating is more destructive to enzymic proteins than brief high temperature. Total destruction is usually not practical or necessary; residual traces are almost sure to be left in the blanched material and during long storage periods the storage condition must be depended upon to slow down the residue of enzyme action to the point at which the product keeps satisfactorily.

B. A. 17, 2053 (1943).

(315) Bancraft, W. D., Applied Colloid Chemistry. Second Edition. New York: McGraw-Hill, 1926.

(316) Banks, A., The Cold Storage of Herring. Dept Sci. and Indust. Res. Ann. Rept. 1938. pp. 95-6. - Investigations were made of the effect of increasing the size of unit on the rate of freezing of herrings, split as for kippering and packed together in a block. Fresh herrings were frozen in brine or in air and stored at -20° and -30° C. and their general appearance, palatability and quality of kippers prepared from them were determined. Kippers made from fish stored at -20° C. were equal (except for some slight opacity and paleness) to those made from fish stored at -30° C. Kippers made from herrings split before freezing and storage were superior to those made from herrings stored in the "round" condition.

B. A. 16, 176 (1942).

(317) Banks, A., Cutting, C. L., and Reay, G. A. The Cold Storage of Smoked Fish. Dept. Sci. and Indust. Res. Ann. Rept., 1938. pp. 98-102. - Further investigations on the cold storage of smoked fish at -30°, -20° and -10° C. for periods of four to eight weeks confirmed the previous findings that fish should be smoked after rather than before cold storage. Tests with wrappers of (1) vegetable parchment, (2) a cellulose derivative and (3) waxed paper backed with aluminum foil indicated that, while aluminum wrappers prevented drying at a temperature of -10° C., a wrapper of any kind could be dispensed with at a temperature as low as -30° C.

B. A. 16, 176 (1942).

(318) Banks, A., "Fish Freezing." Modern Refrig. 47, No. 550, 12 (1944). - Freezing and cold storage of fish in Great Britain; provision of fish at any time of year in condition practically as good as fresh has been object of research at Torry Research Station; brief note on conditions existing in fishing industry prior to war. Before Aberdeen Business and Professional Club.

E. I. 1944, 889

(319) Bardakh, E. Y., "The Role of Supercooling in the Process of Rapid Freezing." Kholodil' naya Prom. 15, No. 5, 19-26 (1937); Chem. Zentr. II. 735 (1938). - Rapid freezing is not the only way of obtaining fine ice crystals in foods. Fine crystals can also be obtained at more moderate freezing temperatures by preliminary treatment of the food with substances which reduce the velocity of crystalization and increase the number of crystalization centers arising in the cells.

C. A. 34, 4163 (1940).

(320) Barker, J., Preservation of Peas by Freezing. Dept. Sci. Indust. Res. (G. Brit.) Food Invest. Board Annual Rept., 1930. pp. 67-70. - The method of preserving peas and other vegetables at -10° to -20° C. after partial cooking has been found very sucessful.

(321) Barker, J. Enzyme Action in the Frozen State at -20°C. Dept. Sci. Ind. Rec. (Brit.), Rept. Food Invest. Board 1931, Sec. E., Fruits and Vegs., 1932. p. 79.

(322) Barker, J. and Morris, T., "The Preservation of Fruits and Vegetables by Freezing." Refrig. Eng. 24, 160-2 (1932). - Information gathered from the work of various authorities and by the authors on the practical applications of freezing and storage with emphasis on the cold pack method.

W. B. C.

(323) Barker, J. and Morris, T. N. (Part I); Garnett, F. E. (Part II), "Is There a Future for Preservation of Fruits and Vegetables by Freezing." Brit. Assn. Refrig. Proc. 29, No. 2, 63-80, 81-94 (1932-33). - Methods of freezing; comparison of products preserved by freezing with those preserved by other methods, such as canning, sulphur dioxidized storage and dehydration; costs and economic aspects of preservation by freezing. Cf. Cold Storage 36, No. 420, 56-8; Ice and Cold Storage 36, No. 421, 62-4, 1933; Ice and Refrig. 84, No. 5, 347, 1933.

E. I. 1933, 959.

(324) Barker, J., Morris, T. N. and Garnett, F. E., "The Preservation of Fruits and Vegetables." Ice and Cold Storage 36, 62-4 (1933). - The preservation of fruits and vegetables by freezing and the biochemical difficulties of this method of food preservation are discussed.

C. A. 27, 4318 (1933).

(325) Barker, J. and Morris, T. N., Analytical Studies of Frozen Vegetables. Dept. Sci. Ind. Research Rept. Food Invest. Board, 1937. pp. 190-4 1938. - Peas stored at -20° C. had better color and flavor than when stored at -10° C. irrespective of the rate of freezing. Usually the loss of solute during thawing and cooking was greater in samples frozen slowly than in those frozen quickly.

C. A. 33, 256 (1939).

(326) Barnes, B., Tressler, D.K., & Fenton, F., " Effect of Different Cooking Methods on the Vitamin C Content of Quick-Frozen Broccoli." Food Research 8,

13-26 (1943). The vitamin C content of quick-frozen broccoli averaged 88 mg per 100 gms. When solid frozen broccoli was boiled in 100 grams of water, it retained 82% of its vitamin C, in 500 grams of water, it retained 60%, in 1000 grams it retained 53%. The extent of loss was approximately the same. The variation was in the amount of vitamin C that went into solution. Slightly defrosted broccoli cooked in a steamer retained about 80% of the vitamin, and in the pressure cooker, retained about 72%, but the product was not uniformly cooked. Cooked broccoli lost 19% of its vitamin C on standing in the refrigerator at 40°F. for 24 hours and 34% on standing for 48 hours. Quick frozen broccoli stored at 0°F. to -10°F. did not lose vitamin C during 5 months storage.

C. A. 37, 2480 (1943).

(327) Barnes, B. and Tressler, D. K., "Thiamine Content of Fresh and Frozen Peas and Corn Before and After Cooking." Food Research 8, 420-7 (1943). - Fresh peas, shelled or unshelled, and fresh unhusked corn did not lose thiamine when they were held at room temperature for five hours. Frozen peas and corn stored at -17.8 to -23.3° C. for one year did not lose thiamine. Different cooking methods resulted in 64 to 84% retention of the thiamine in peas and a 63 to 85% retention in corn. Variety was not a factor influencing the amount of soluble or retention of thiamine in the cooking of fresh or frozen peas.

C. A. 58, 421 (1944).

(328) Barnicoat, C. R., "'Store-burn' in Frozen-Meat-By-Products." New Zealand Jour. Sci. & Tech. 15, No. 4, 248-54 (1934). - "Store" or "freezer burn" is apt to occur in meat small-goods (liver, kidneys, etc.) during prolonged cold-storage, and is due to superficial desiccation of the tissues. When typical small-goods (sheep's kidneys) were stored for three months at 12° F., incidence of "burn" was roughly proportional to the degree of desiccation (as measured by loss in weight during storage), and varied from nil to 7.7%. Desiccation was favored by fluctuations in relative humidity consequent on variations in air temperature (± 3° in this experiment). When suitable wrappings of transparent moisture-proof cellulose type were used there was no loss of moisture and no "store-burn", even when cold-store temperature was somewhat unsteady; but wrappings must be securely sealed by double folds. On the other hand, a poor type of paper can increase the incidence of "store-burn" beyond that shown by unwrapped controls. "Dipping" the samples in blood-serum prior to freezing, to provide a glaze which might be expected to dry out rather than the meat tissue itself and thus delay onset of "burn", did not give satisfactory results.

B. A. 9, 843 (1935).

(329) Bartlett, L. H. and Woodrick, W. R., "Polyphase Freezing Process Developed; Low cost Unit Built." Food Industries 13, No. 12, 60-2, 103 (1941); Food Industries 14, No. 1, 62-4 (1942). - Details of quick freezing system of Texas Research Corp., mechanical units of which include standard refrigerating unit and machine which maintains polyphase medium in operating condition, effects contact between it and foodstuff, and separates two after freezing is completed.

E. I. 1942, 922.

(330) Bartlett, L. H. and Brown, H. E., "New Quick Freezing System." Refrig. Eng. 42, No. 2, 147-8 (1941); Architectural Eng. and Industry J. 4, No. 2, 3-11 (1941); Modern. Refrig. 44, No. 523, 147-8 (1941). - Authors working at University of Texas on direct contact methods of freezing foodstuffs, have perfected "polyphase" quick freezing system which is described; new system retains advantages of direct contact systems used heretofore, and overcomes some of the handicaps previously met in practice. Bibliography. Before Food Preservation Council, Univ. of Texas.

E. I. 1941, 1026.

(331) Baselt, F. C. and Ball, C. O., "Temperature Measurement and Control in the Food Industry." News Ed. (Am. Chem. Soc.) 18, 391-3 (1940). - From -40° to 500° F., i.e., quick-freezing to roasting temperatures, the food industry's range of temperature measurement is not large, and demands for instantaneous and accurate results are not great. Thus, for beans it has been shown that exposure to 250° F. for three minutes, 240° for twelve minutes, or 230° for 55 minutes, will produce sterilization. Many methods and results of investigations on food processing are given.

C. A. 34, 4471 (1940).

(332) Batchelder, E. C., Miller, K., Sevals, N. and Starling, L., "The Vitamin A and C Content of Frozen Blackberries." J. Am. Dietetic Assn. 11, 115-8 (1935). - Frozen blackberries are relatively high in vitamin A content - but not outstanding; and relatively low in Vitamin C content - but not entirely deficient. Methods and specific data for determinations of vitamin content are given.

F. F.

(333) Bates, P. K. and Highlands, M. E., "The Determination of Storage Conditions - Meat Refrigeration, Its literature and Methods of Analysis." Refrig. Eng. 27, 299 (1934). - Study of storage conditions from standpoint of (1) microbic infection, (2) temperature, (3) relative humidity of air, (4) velocity of air and (5) reaction of food with air.

W. B. C.

(334) Bauernfeind, J. C. and Siemers, G. F., "Adding Ascorbic Acid to Peaches Before Freezing." Food Industries 17, 745-6 (1945). - See next abstract.

(335) Bauernfeinf, J. C. and Siemers. G. F., "Retardation of Discoloration in Frozen Sliced Peaches by L-Ascorbic Acid." Quick Frozen Foods 7, No. 12, 46, 60 (1945). - The browning of unblanched, frozen, sliced peaches during storage or after thawing can be delayed by treatment of the cut fruit with ascorbic acid before freezing. No unnatural flavors are introduced. A suitable method of treatment is suggested.

C. A. 39, 4407 (1945).

(336) Beard, F. J. and Nelson, P. M. Influence of Low Temperatures Upon Beef and Pork Held in Storage for Different Intervals. Iowa Agri. Expt. Sta., Ann. Rept., 1939, pp. 92-3; 1940. pp. 119-22. - The meats were frozen at 0° F. and 10° F., well wrapped and held in storage at 0°, 10° and 15° F. At intervals, physical and microscopic examinations were made.

The rate of shrinkage was extremely variable, the most shrinking occurring between the 60th and 90th days, followed by a marked decline from the 90th to the 120th days in storage. The pH value dropped from 6.2 to 5.7 in the 60-90 day storage period, then suddenly rose to 6.6 on the 120th day. Palatability was little affected by temperature or period of freezing. The microscopic structures of the meats were also similar. Where freezing was delayed in the deep layers, the crystal size of the ice increased.

C. A. 36, 5910 (1942).

(337) Beckley, V. A. and Notley, V. E., "Drying of Vegetables." E. African Agric. Jour. 7, 3-7 (1941). - Among other things it mentions blanched potatoes and cauliflower and dried vegetables.

B. A. 16, 1878 (1942).

(338) Beckwith, T. D., "Molds in Cold Storage." Ice and Refrigeration 90, 159-60 (1936).- Conditions of temperature, moisture content, acidity and oversupply under which the growth of molds is retarded is discussed.

C. A. 30, 8407 (1936).

(339) Bedford, Berry, Boggs, Cambell, et al., Locker and Home Freezing of Farm Products. Washington Agriculture Experiment Station, Popular Bulletin No. 180, 1945.

(340) Bedford, C.L. and Joslyn M.A., "Enzyme Activity in Frozen Vegetables - Stringbeans." Ind. Eng. Chem. 31, 751-8 (1939). - Cf. Joslyn, M.A. et. al., Ibid., 30, 1068 (1938). Blanching stringbeans for two minutes at 85°C., or 5 minutes at 82.2°C., or the uncut less mature beans for 2 minutes at 100°C., before storing at -17°C. inactivates the enzymes and results in an improved flavor. Less heat is required for destruction of the ascorbic acid, oxidase, and for the catalase activity, which is related to acetaldehyde content of the stored bean. The peroxidase has a greater effect on the flavor and requires a higher blanching temperature to inactivate it. Impregnation with acid inactivates the enzymes but disintegrates the vegetables. C. A. 33, 5534 (1939).

(341) Bedford, R. H., "A New Ice Glaze for Frozen Fish." Ice and Refrigeration 90, 217-18 (1936). - The physical and chemical effects of storage of fish at low temperature are reviewed. In order to prevent loss of water from frozen fish and thereby prevent the physical and chemical changes coincident with dehydration, frozen fish are glazed with a film of ice. This film of ice is brittle and cracks readily when the glazed fish are returned to the low temperature storage room. A eutectic solution is therefore recommended for glazing. The fish are dipped in this solution at a temperature closer to the freezing storage temperature; hence cracking does not occur so readily. Moreover it is possible to put on the required layer of glaze with fewer immersions of the fish in the eutectic solution than in water. C. A. 30, 8415 (1936).

(342) Beins, "Meeting Competition Successfully Through Quality Control of Frozen Vegetables." Western Frozen Foods 6, No. 9, 3-5 (1945).

(343) Bell, J. O., Cold Storage Reports, Season 1917-1918. U. S. Dept. Agri. Bull. No 776, 1919. pp 1-44. - Cf. C. A. 13, 622. A review of the

1917-1918 season for cold storage of apples, creamery butter, packing stock butter, American cheese, case eggs, frozen eggs and poultry.

C. A. 13, 1885 (1919).

(344) Berges, P. First Attempts at Preservation and Shipment of Chilled and Frozen Meats. Boll. Min. Agr., Buenos Aires, 1908. pp. 387-421. - This is a historical sketch of the beginnings of the refrigerated meat industry. It is concluded that: to the French belongs the honor of discovering and demonstrating the use of artificial cold for the preservation and carrying of meats and other products destined for food. The English have exploited the industry with great profit; since 1880, when the first cargo of frozen meat arrived at London from Australia, English capitalists have established twenty-two refrigerating plants in Australia, twenty-three in New Zealand, eight in Argentina. These plants in 1907 exported to England 5,801,535 carcasses of mutton, 4,348,992 of lambs, 177,383 tons of chilled beef and 130,765 tons of frozen meat; France has not more than six plants equipped with refrigerating chambers, while Germany has 390 plants thus equipped.

C. A. 3, 672 (1909).

(345) Berges, P. The Nutritive and Digestive Qualities of Argentine Refrigerated Meats. Boll. Min. Agr., Buenos Aires, 1908. pp. 473-504. - This is a summary and discussion of experiments by Gautier, A. on the comparative alimentary value of French fresh meats and Argentine frozen meats; and of S. Rideal on the comparative value on nutritive and digestive qualities of Argentine frozen and refrigerated meats and of English fresh meats. The conclusions are that Argentine frozen and refrigerated meats are at least equivalent in alimentary value to the best English and French fresh meats.

C. A. 3, 673 (1909)

(346) Bergstein, F. D., "Importance of Flexibility in Protective Coatings for Frozen Foods." Refrig. Eng. 37, 352, 356 (1939). - The great importance of moisture-vapor-proofness of containers for frozen foods is well established. One of the methods in chief use for obtaining this proofing is through coatings. A principal difficulty with most protective coatings is their tendency to become brittle at low temperatures. This is usually of greatest danger at folds and corners. To overcome the hazards as few folds and corners as possible should be contained in the package - particularly creases should be employed. All coatings should be proved completely flexible at zero and sub-zero temperatures, and all coatings should be tested under actual operating conditions. Moisture-resistance should not be sacrificed for flexibility.

F. F.

(347) Bergstein, R. M., "Packaging Frozen Foods." Refrig. Eng. 36, 300-2, 318 (1938). - Because of chance damage or failure of air-tight seal to hold, the packa ing of frozen foods in packages made of board alone has not proved satisfactory. Therefore a moisture-vapor-proof liner has been developed and is used inside of a box or carton which produces the desired rigidity and mechanical requirements. The qualifications for a frozen food container are summarized.

F. F.

(348) Bergstein, R. M., "Packaging - 1940." Quick Frozen Foods 2, No. 7 24, 29 (1940).

(349) Berry, J. A., "Microbiology of Frozen Pack Berries and Vegetables." Ice & Refrig. 84, No. 3, 204-5 (1933). - Paper presented at Convention of N. W. Fruit Barrelers Assn; summary of studies to determine suitability of freezing temperatures for frozen pack berries and vegetables; Microbiological analyses; effect of freezing upon microbiological content of blackberries and strawberries.

E. I. 1933, 959

(350) Berry, J. A., "Destruction and Survival of Micro-organisms in Frozen Pack Foods." J. Bact. 26, No. 5, 459-70 (1933). - The microbiological content of small fruits in sucrose solution stored at -2°, -4°, -7°, -10° and -20° C. tended to decrease most rapidly at the higher temperatures, - e.g. reduction in strawberries being 60% at -20° C and 89% at -10° C in four months. There is evidence that carbon-dioxide from respiration of the fruit is responsible in large part for the destruction of microorganisms. The air-tightness of the container apparently affects the microbial death rate. In vegetables preserved at -10°, lactobacilli and "colon" organisms have been found to persist two years. Under aerobic conditions, Cladosporium, sp. and Torula, sp. grew at -2°, and Pseudomonas, sp. at -4°. Yeasts in wort exposed to -10° were largely destroyed in 3 days, when the medium froze; when it remained liquid, approximately 50% were alive after five days.

B. A. 8, 2017 (1934).

(351) Berry, J. A., "Lactobacilli in Frozen Pack Peas." Science 77, 350-1 (1933). - Details of an experiment on the survival of lactobacilli in peas stored from one to twenty-six months at from 5 to 15° F. are given. The lactobacilli survived this storage regardless of the method of preparation (blanching, packing in brine, etc.) or method of packaging. The most common type of lactic acid bacteria found was Lactobacillus, Cucumeris, Aerobacter Aerogenes was also found commonly.

F. F.

(352) Berry, J. A., "Cold Tolerant Micro-Organisms and Frozen Pack." Canner 78, No. 11, 13-14 (1934).

(353) Berry, J. A., "Temperature Is Not Sole Consideration in Frozen Pack, Research Reveals Effect of Other Factors on Spoilage." Food Industries 6, No. 6, 269 (1934). - Effect of type of container, acidity of product and nature of packing liquor upon frozen pack method of preserving fruit and vegetables; research of Frozen Pack Laboratories of Bureau of Plant Industry, Seattle, Washington.

E. I. 1934, 931

(354) Berry, J. A. and Magoon, C. A., "Growth of Microorganisms At and Below 0°." Phytopathology 24, 780-96 (1934). - Psendomonas flourescens and species of Sactobacillus, Torula, Monilia and Penicillium may show growth at -4°. Growth of species of Cladosporium and Sporotrichum may even occur at -6.7°. These organisms were isolated from frozen-pack fruits and vegetables.

C. A. 28, 6869 (1934).

(355) Berry, J. A., "Microbiological Studies of Frozen Pack Berries With Special Reference to Carbonation." Proc. Am. Soc. Hort. Sci. 33, 224-6 (1935-1936). - In packs of strawberries, raspberries, and blackberries in No. 2 cans, stored at -5° F. and 15° or 20° F., microbial destruction was in all cases more rapid at the higher temperature. After 12 months storage, less than 1% of the microorganisms survived at 15° F. and about 6% survived at -5° F. Addition of about 0.5 gm. solid carbon-dioxide immediately before sealing the containers failed to affect significantly the microbial death rate. After five months storage, unbroached samples placed in a household refrigerator at 40° F., maintained fairly good quality for two or three weeks.

B. A. 11, 143 (1937).

(356) Berry, J. A., "Freezing Preservation." Ice and Refrigeration 93, 286-8 (1937).

(357) Berry, J. A. Preparing and Freezing Fruits and Vegetables for Users of Refrigerated Lockers. Washington State College, Proceedings 11th Ann. Institute of Dairying, 1938. pp. 99-103.

(358) Berry, J. A., "The Fewer the Bacteria, the Better the Frozen Pack." Canner 94, No. 4, 13-14 (1941).

(359) Berry, J. A., "Preserving Fruits and Vegetables in Frozen Food Lockers." Western Canner 34, No. 4, 50-2 (1942). - Freeze only what is naturally sound and at right stage of maturity; avoid delays in handling foods for freezing; scald for proper blanching of vegetables; pack fruits in sugar syrup; select packaging which is airtight and free from taint; freeze promptly after packing; store at constant temperature no higher than 5° F. Use foods promptly after taking from storage.

F. F.

(360) Berry, J. A., "Frozen Foods Have Good Health Record." Quick Frozen Foods 6, No. 3, 46 (1943).

(361) Berry, J. A., "Experiments at Western Regional Laboratory Forecast Future." Quick Frozen Foods 7, No. 6, 44-45 (1945). - Summary of talk at Northwest Frozen Foods Association meeting. Postwar development of the frozen foods industry, it is said, will depend on cost to the consumer and production of quality products. The Laboratory's work is described. Frozen whole or sliced tomatoes have not proved satisfactory as yet, although frozen tomato juice is promising. Research is said to be needed on rate and degree of heat application in blanching, also on the cooling of blanched vegetables. "Research on methods of freezing will probably find its most fertile field in the realm of fundamental engineering principles and equipment design, not so much from the standpoint of quality improvement as from the standpoint of lowering operation and production costs." Work is reported on turkey freezing; egg freezing; the freezing of figs, prunes, and plums (whole and dry), also berries (blackberries, raspberries, and strawberries, with and without sugar) and apricots and peaches. Freezing in lug boxes as the fruit comes from the orchard is discussed, although this process (described) has only "limited commercial feasibility"

as yet. The use of antioxidants to retard sliced peach decoloration is discussed - l-ascorbic acid and d-iso-ascorbic acid. Many other topics are included, among them a discussion on the bacteriology of frozen foods. While great care must be exercised with uncooked foods, the bacteriology of precooked foods is somewhat different, and "so far no difficulty appears to have been encountered". B. H. W.

(362) Berube, L., "Modern Practice In Preservation of Fish by Cold." Food Indust. 9, 645 (1937); Refrig. Eng. 34, 305-7 (1937). - The development of cold preservation and freezing methods for fish are reviewed. To date the best methods employ mild antiseptic washes to cut down bacterial contamination and packing in antiseptic ice for preservation; liquid solutions of brine for freezing preservation of small fish and air blast freezing for larger fish. A liquid solution using no brine would be better, for brine has a deteriorating effect upon the appearance of fish. The trend in cold preservation is toward quick-freezing fish as soon as possible after catching as the fish remains fresher when thus processed.

F. F.

(363) Bidault, "Molds on Frozen Meats." Bull. Soc. Hyg. 10, 12-25 (1922). - Choctostylum fresenii Van Thieghem, Thamnidium elegaus Link Spee, Penicillium crustaceum Fries, Hormodendron cladosporoides Bonorden, Cladosporium herbarum Link, Stysanus stimonites Persom, Botrytis Micheli and some varieties of Eubotytis were isolated from frozen meat. From meat that had been thawed after freezing and kept for a number of days at 15° in a dry atmosphere, Mucor racemosus Fresinius, Mucor spinosus Van Thiegham, Mucor-mucedo Linne and Mucor pusillus Link were obtained. Molds causes neither a decrease in nutritive value of frozen meats nor the formation of toxins although such meat had a disagreeable odor. As a prophylactic measure, preservation of the meats at -10°C. in a dry atmosphere is suggested with prompt fumigation of infected refrigerating rooms.

C. A. 16, 2370 (1922).

(364) Bidault, "The Molds of Frozen Meat." Rev. Gen. Froid. 3, 246 (1922); Bul. Mens Off. 14, 1579 (1922). - A general paper giving details of technique of identification, notes on the frequency of various species, and preventative measures. Cf. Bidault, Bull. Soc. Hyg. 10, 12 (1922).

C. A. 17, 1515 (1923).

(365) Bilham, P., "Refrigeration in the Food Industry." Soc. Chem. Ind. Jour. 53, 436-40 (1934). - This article is a discussion of the uses of refrigeration in the food industry and its advantages with frozen foods among other things. This review of the situation and its problems points out the need and advantages of the technologist added to the results of research to improve the methods of the industry and the resulting products.

E. M. F.

(366) Bilham, P., "The Concentration of Fruit Juices by Freezing." Chem. & Indust. (London) 57, 589-93 (1938). - Freezing for concentration of fruit juices is advantageous over evaporation in that (1) volatile constituents are not lost, (2) heat-labile substances, such as flavors and colors, are not destroyed, (3) energy required is less, (4) foaming is obviated. An important disadvantage is difficulty of separation of ice without too great losses. B. A. 13, 1014 (1939).

(367) Bilyanskii. F. M., "Selecting Vegetables for Freezing." Konservan i Plodoovoshch-naya Prom. 10, No. 5, 22-3 (1939). - Tabulated data show the comparative crop yields, characteristics and content of dry matter, soluble matter, sugars, vitamin C for several varieties of peas and beans. Suitability for freezing is discussed as related to these properties.

C. A. 36, 5276 (1942).

(368) Birdseye, C., "Scientific Aspects of Packaging and Quick-freezing Perishable Flesh Products." Ind. End. Chem. 21, 414 (1929). - Experiments indicate that slow freezing of meats forms large ice crystals, which compress and rupture tissues. Foods quickly frozen by direct or indirect contact with the refrigerant have the following advantages: the small ice crystals thus formed do not injure the tissues; the texture, flavor, color and odor of the product are retained; there is no shrinkage from loss of water.

C. A. 23, 3030 (1929)

(369) Birdseye, C., "Scientific Aspects of Packaging and Quick-freezing Perishable Flesh Products. II. Packaging Flesh Products for Quick Freezing." Ind. Eng. Chem. 21, 573-6 (1929). - Deterioration of flesh products during freezing and transportation may be caused by desiccation, oxidation, discoloration and absorbtion of odors, any of which change the flavor of the product. Some of these difficulties are remedied by packaging before freezing so that compactness is obtained, and by the use of air and moisture-proof packing material and shipping cases.

C. A. 23, 3278 (1929)

(370) Birdseye, C., "Some Scientific Aspects of Packaging and Quick-freezing Perishable Flesh Products. III. Sanitary Measures in a Fish Dressing Plant." Ind. Eng. Chem. 21, 854-7 (1929). - Cf. Ibid. 21, 573 (1929)

C. A. 23, 4750 (1929)

(371) Birdseye, C., "Packaging Quick-frozen Foods." Food Ind. 2, No. 4, 156-58 (1930). - Packaging requirements of frozen-food products, satisfactory packaging of present most difficult problem; kinds of packaging materials; corrugated fiberboard shipping cases used. Cf. Canning Age 11, 329 (1930), "Packaging Perishables for Quick-Freeze."

E. I. 1930, 748.

(372) Birdseye, C., "Quick-frozen Fish in the United States." Ice and Cold Storage 33, No. 382, 9-10 (1930). - History and growth of fish fillet business in United States; freezing in blocks and in package: frozen product increasing.

E. I. 1930, 1499.

(373) Birdseye, C., "The Quick-freezing of Perishable Foods." Ice and Refrig. 78, No. 6, 547-52 (1930); Refrig. 48, No. 1, 23-7 (1930); Refrig. World 65, No. 8, 7-11 (1930); Oil Power 5, No. 9, 140-2 (1930). - Some limitations of present sharp freezing methods; effect of quick freezing and thawing upon meat products; deterioration and keeping qualities in

cold storage; demonstration and general discussion. Before Am. Inst. of Refrig.

E. I. 1930, 1500.

(374) Birdseye, C., "Corrugated Fiberboard Shipping Containers." Refrig. Eng. 19, 75-7, 78-80 (1930). - The use and insulating value of corrugated shipping containers is presented and discussed fully by the author with other workers in the field. Illustrations and photographs. Paper delivered at the meeting of Am. Soc. Refrig. Eng., 1929.

F. F.

(375) Birdseye, C., "Preparation and Distribution of Frozen Perishable Products." Refrig. Eng. 19, 173 & 180 (1930). - Elasticity of cell walls of animal tissue allows expansion of cells during freezing whereas inelasticity of vegetable cell walls leads to their rupture during freezing whether method is quick or slow. Quick freezing is better than slow for it cuts down bacterial growth and retards oxidation. Difficulties encountered in thawing, packaging, equipment for storage and display and other topics are discussed briefly.

F. F.

(376) Birdseye, C., "Fisheries Enlist Chemical Engineering to Rationalize an Ancient Industry." Chem. & Met. Eng. 38, 320-24 (1931). - History of progress of fish preservation.

W. B. C.

(377) Birdseye, C., "Resume of Quick-freezing Problems." Eng. Soc. Boston Jl. 2, No. 5, 9-25 (1931). - Two years progress in preparation and distribution of perishable food products preserved solely by refrigeration; limitations of present sharp-freezing method; what happens when slow frozen products are thawed, when plant tissues are frozen; quick vs. slow freezing of vegetable matter; storage and transportation problems; packaging perishables for quick freezing; variety selection and plant location; cost of quick frozen packaged foods; future of quick freezing.

E. I. 1931, 1206.

(378) Birdseye, C., "Where Quick-frozen Vegetables Stand Today." Food Indust. 3, 213 (1931). frozen haddock fillets, depends upon many factors: (1) varietal selection, (2) proper preparation for freezing-blanching, (3) proper degree of maturity of product to be frozen, (4) method and temperature of quick freezing, (5) storage after freezing completed, (6) packaging.

F. F.

(379) Birdseye, C., "Bringing Quick-freezing to Seasonal Crops." Food Indust. 3, 490-91 (1931). - The first authenic description of the multiplate freezer is given. It consists of a series of refrigerated metal plates placed one above the other, capable of being opened to receive products between them, and closed upon the products with any desired degree of pressure. It is a portable unit - smaller models being entirely self-contained - and can be operated anywhere that electric current and cold water are available.

E. M. F.

(380) Birdseye, C., "Effect of Quick-freezing on Distribution of Fruits and Vegetables." Ice & Refrig. 80, No. 2, 131-33 (1931). - Process of freezing animal and plant tissues; deterioration during cold storage; transportation of quick-frozen perishables. Before Am. Fruit and Vegetable Shippers Assn.
E. I. 1931, 1206.

(381) Birdseye, C., "Freezing of Foods." Section in Refrigerating Data Book. New York: Am. Soc. Refrig. Eng., 1932. Vol. I, pp. 337-40. - Discussion of freezing of foods considering: (1) biological and chemical aspects, (2) thermal considerations, (3) low temperature refrigerating machinery, (4) storage, and (5) packaging. Bibliography.
W. B. C.

(382) Birdseye, C., "Probable Influence of Quick Freezing on the Shellfish Industry." Transactions American Fisheries Society 62, 80-3 (1932).

(383) Birdseye, C., "Portable Quick Freezing Apparatus." Ice & Refrig. 82, No. 5, 375-7 (1932). - Illustrated description of portable freezers developed by Birdseye Laboratories, Gloucester, Mass., need for and charateristics of this equipment; various types of multiplate freezers; large field available. Cf. Cold Storage 25, No. 11, 131-2 (1932).
E. I. 1932, 1108.

(384) Birdseye, C., "Production and Distribution of Quick Frozen Perishable Foods in U. S." Ice & Refrig. 83, 223-7 (1932).

(385) Birdseye, C. and Fitzgerald, G. A., "History and Present Importance of Quick Freezing." Ind. Eng. Chem. 24, 67-8 (1932). - The history and present status of the frozen food industry are outlined. The important role played by chemical research in the development of the industry is stressed. Twenty-nine references are appended.
C. A. 26, 4108 (1932).

(386) Birdseye, C., "Preservation of Perishable Foods by New Quick Freezing Methods." J. Franklin Inst. 215, No. 4, 411-24 (1933). - Plant and animal tissues are always somewhat altered by freezing. Some products require quicker freezing than others; but, generally speakin , the faster the freezing the better the product. As a rule, flesh products require to be frozen faster than vegetable, one to three hours giving excellent results with animal tissue, and two to six hours being satisfactory with fruits and vegetables. However, to be commercially successful, quick-freezing must be regarded not as a mere freezing operation, but as a complete system of handling perishable food products by low temperature constantly applied. Careful attention must be given to every step - selection of raw materials, prefreezing treatment, packaging, freezing, storage, transportation, marketing, and even preparation for the table. Considerably more than 100 different meats, poultry, seafoods, vegetables, and fruits have been commercially quick frozen. All may be kept in storage without deterioration for one year or longer at 0° to 5° F. Preservation and distribution by quick-freezing are not unduly expensive.
B. A. 8, 1623 (1934).

(387) Birdseye, C., "Quick Frozen Poultry." Proc. 5th World Poul. Conf. (Summ) 4, No. 123, 492 (1933-34).

(388) Birdseye, C., "Preservation of Foods by New Quick Freezing Methods." Refrig. Eng. 25, No. 4, 185-8, 201 (1933). - Definition of quick-freezing raw materials; pre-freezing treatments; packaging; freezing; storage; transportation and marketing; quick-frozen foods in the home; health values; costs of quick frozen foods; research and future of quick freezing. Before Am. Soc. Refrig. Eng. Cf. J. Franklin Inst. 215, No. 4, 411-24 (1933); Genie Civil 103, No. 7, 165-6 (1933). E. I. 1933, 959.

(389) Birdseye, C., "Progress of Quick-freezing in United States." Ice & Refrig. 89, No. 3, 129-30 (1935). - Report made in end of 1934; advantages of quick freezing perishable foods; history of quick freezing; brief outline of frozen foods being produced; packing; storage and transportation; present marketing situation and probable future developments.
E. I. 1935, 912

(390) Birdseye, C., "Gravity Froster." Refrig. Eng. 40, No. 5, 281-5 (1940). - Description of process and apparatus for inexpensively quick-freezing very large quantities of "bulk" foods which, for sake of both economy and convenience, must be packaged in relatively large containers; effects of "gravity frosting" upon quality; operating characteristics; cost factors; patent situation. E. I. 1940, 1023.

(391) Birdseye, C., "Frozen Foods in War Economy." Proc. Inst. Food Technol. 34-36 (1943). - War conditions have advanced public acceptance of quick-frozen packaged foods by at least five years. Reasons are increased public buying power, large purchases of armed forces, shortages of canned foods, excellent vitamin retention, and rationing. Quick-freezing permits important savings in tinplate and in the perishable food industry - will enter a post war era of rapid development and intense competition. Perhaps relatively few unprocessed "fresh" vegetables will be sold. Lowered trade barriers and world-wide refrigeration facilities will bring tropical and arctic delicacies to the smallest villages. Huge mechanically operated farms and processing plants may center around such virgin areas as Grand Coulee Dam and produce unbelievable tonnages at very low costs; thus it will seriously affect less efficient farming areas. B. A. 18, 906 (1944).

(392) Birdseye, C., "Higher Quality and Lower Costs Needed in Food Processing." Ice & Refrig. 109, No. 3, 62 (1945).

(393) Blanchard, E. L. and Maxwell, M. L., "Correlation of Subjective Scoring with Sugar Content of Frozen Peas." Food Research 6, 105-15 (1941). - The sugar content and the subjective scores were equally related to maturity. Variation in trend in the sugar content and scores on successive days of picking indicated that the edible quality of frozen peas may be affected by changes in the freezing procedure as well as by maturity.
C. A. 35, 6009 (1941).

(394) Blanchet, A., "Enzyme Activity at Cold-storage Temperatures." Le Froid 5, 6-9 (1917); Bull. Agr. Intelligence 9, 767 (1917). - The inves-

tigations carried out by B. in 1913-14 (Cf. C. A. 8, 2733) aimed at establishing the activity of certain enzymes at temperatures slightly below 0° generally used in the cold-storage extablishments for storing products in which action of such enzymes or others of the same group may occur. B. studied a lipase to ascertain its action at temperatures corresponding to those used in preserving butter and other fats. The enzyme examined was one existing in the cytoplasm of castor-oil seeds. The castor oil seeds were crushed in a mortar and then mixed with castor oil. The mixture was then acidified with acetic acid. The oil, seeds, and acetic acid were previously cooled during twenty-four hours in cold rooms. The acidity was established with normal soda after the alcoholic reaction had ceased. The activity of lipase at lab temperature (17°) was also tested. The results show definitely that, even at -5°, the lipase is sufficiently active to cause a fairly rapid saponification of the fats. There is therefore, no reason why a certain number of the changes fats undergo while in cold storage should not be attributed to the action of enzymes of the same group. The fact that the good keeping of butter is in inverse ratio to the acidity of the cream at the time of churning confirms this hypothesis, for the action of lipases is generally favored by a certain acidity. This was confirmed by the enzyme studied by B. as well as the sero-lipase.

C. A. 12, 2204 (1918).

(395) Bland, F. O. S., "Brine Concentrator Plant." Modern. Refrig. 44, 524, 162 (1941). - Description of installation designed by author for cold storage plants with wet air coolers in order to cut down cost of fresh calcium chloride which is added to weak brine; equipment consists of gravity feed concentrator heated by steam and tanks for weak and strong brine.

E. I. 1941, 261.

(396) Bland, F. O. S., "Insulated Doors." Mod. Refrig. 45, No. 528, 42 (1942). - Satisfactory door for temperatures down to -5° F. described.

E. B.

(397) Blatti, A.L., "Cold Storage Locker Plants." Metallurgia 15, No. 90, 371-4 (1937); I & R 92, 371-4 (1937). - Economic advantage and construction details of locker plants; floor plans of typical plants; operation.

E. I. 1937, 257.

(398) Bloom, S. C., "Brine Spray Refrigeration Systems." A. Soc. Refrig. Eng. J. 8, No. 4, 308-21 (1922). - Experiments carried out with Webster nozzles and overhead spray systems. E. I. 1922, 537.

(399) Bloom, S. C., "Quick Frozen Foods." Refrig. Eng. 18, 165-9 (1929). - Points out that quick-freezing of foods has opened a new field for refrigeration, gives the economic considerations - effect on manufacturer and merchandiser, discusses conventional freezing methods, various inventions connected with methods, and the fundamentals of the art of freezing. Kolbe and Zarotschenzeff processes. F. F.

(400) Blumenthal, S., Food Manufacturing. (A Compendium of Food Information) Brooklyn: Chemical Publishing Co., Inc., 1942. - Methods and equipment are briefly described. Among other things such processes as freezing, sulfuring and drying are described. B. A. 17, 75 (1943).

(401) Bodle, "Importance of Zero (F.) Not Fully Understood." Western Canner & Packer 30, No. 8, 32-3 (1938).

(402) Bogdanova, V. A., "Influence of Storage on Vitamin C Content of Frozen Strawberries." Voprosy Pitaniya 9, No. 3, 29-34 (1940). - The vitamin C content of strawberries when freshly frozen with 50 weight % of sugar was approximately 50 mg % and after storing nine months at -18° C. there was no appreciable loss in anti scorbutic potency. Color, odor and flavor were also obtained. C. A. 35, 6685 (1941).

(403) Bogdanova, V. A. and Shepilevskaya, N. E., "Frozen Black Currants as a scource of Vitamin C." Voprosy Pitaniya 9, No. 3, 35-40 (1940). - Black currants frozen with 50 weight % sugar still contained at least 1000 biological units of vitamin C per kilogram after storing them 3.5 months at -18° C. After 10 months of storage there was no appreciable loss. C. A. 35, 6684 (1941).

(404) Boggs, M. "Methods for Cookin Frozen Vegetables." Western Canner & Packer 32, No. 2, 47-8 & 54 (1940).

(405) Boggs, M., Campbell, H., and Schwartze, C.D., "Factors Influencing the Texture of Peas Preserved by Freezing. I." Food Res. 7, No. 4, 272-87 (1942). - The specific texture investigations reported in this paper are as follows: (1) the amount of variation for a given sieve size and variety of peas grown in the same field and harvested on the same day; (2) variations for a given sieve size and variety of peas grown in the same field but harvested on different days of the same season; (3) effect of cooking for 5, 10, and 15 minutes; (4) effect of vining; and (5) effect of delay between vining and freezing. The results of these investigations are given in the authors summary. E. M. F.

(406) Boggs, M.M., Campbell, H. and Schwartze, C.D., "Factors Influencing Texture of Peas Preserved by Freezing. II." Food Res. 8, No. 6, 502-515 (1943). - The purpose of this paper is to present the result of a study of the effects of additional handling procedures on the texture of skins of cooked frozen peas, as follows: (1) skin texture variations for peas separated by brine flotation after scalding; (2) comparison of the skin texture of fresh peas, peas held at -17.8°C. (0°F.) for 24 hours, and peas held at the same temperature for six months; (3) comparison of the effect of delay between vining and freezing and between vining and cooking of fresh peas; (4) the effect of thawing and refreezing peas prior to cooking; and (5) the separate effects of bruising and vine juice on the skin texture of cooked frozen peas. The special handling procedures required in order to investigate a particular treatment are apparent in the summary of results given in the author's summary. Parts I and II also appear in Food Industries 15, 122-3 (1943).

E. M. F.

(407) Bonney, V. B., "Testing Frozen Fruits for Appearance, Flavor, Edibility and Mold." Glass Packer 3, 341-4 & 357 (1930). - Fruits when frozen with sugar or syrup yield a higher quality product. Syrup is preferable to granulated sugar. A vacuum pack, because of air exclusion from the cans produces better quality. Tin enameled cans, glass jars and paraffined

containers of paper are suitable containers. Any te perature less than 20° F. is satisfactory for holding the frozen fruit in stora e. Clean frozen fruit in heavy syrup may be kept at room temperature for several days without spoilage.

C. A. 24, 5080 (1930).

(408) Booker, L., Hartzler, E. R., and Hewston, E. M. A Compilation of the Vitamin Values of Foods in Relation to Processing and Other Variants. United States Department of Agriculture, 1942. 244 pages. - The vitamin A value, thiamin, ascorbic acid, riboflavin, and vitamin D content of 290 foods as recorded in the literature from the date of establishment of the latest international standard for each vitamin through December 1940 are presented. The data show the effect of variety or species, geographical location, soil conditions or feeding-practices, processing, and method of analysis on vitamin content.

E. M. G.

(409) Booker, L. E. and Marsh, R. L., The Vitamin A Values of 128 Foods as Determined by the Rat Growth Method. U. S. Department of Agriculture, Technical Bulletin 802, 1941.

(410) Bouquet. Problems in Growing Vegetables for Canning and Freezing. Oregon Agriculture Experiment Station, Circular 362, 1945.

(411) Bowes, C., "Quick Frozen Cooked Foods Now in Demand." Food Indust. 15, No. 2, 52-3 (1943). - Quick frozen ready-to-serve foods have good flavor, are not expensive and keep indefinitely, they may become common after the war, especially if nutritional quality is superior to that of home cooked foods.

B. A. 17, 1649 (1943).

(412) Bracewell, M. F. and Zilva. S. S., "Vitamin C in the Orange and the Grapefruit." Biochem. Jour. 25, No. 4, 1081-89 (1931). - The vitamin content of the juice was the same whether the fruit was picked at the beginning or end of the season. Two months storage at 15° did not cause a loss in vitamin content. There was no definite correlation between the soluble solids, or acid content (calculated as citric acid), and antiscorbutic potency.

B. A. 7, 1576 (1933).

(413) Brackett, A. B., "Package Problems Confronting Quick Frozen Food Industry." Paper Trade J. 116, No. 11, 36-9 (1943); Paper Ind. & Paper World 25, No. 3, 300-02 (1943). - A general discussion of the requirements to be met by materials used for packing various types of quick-frozen foods, indicating progress accompolished to date.

C. A. 37, 3602 (1943).

(414) Bradley, S. K., "Packaging Trends in Quick Frozen Foods." Quick Frozen Foods 1, No. 1, 18 & 60 (1938).

(415) Brady, Jones and McAllista. Freezing Foods for the Home. North Carolina Agriculture Extension Circular 280, 1945. - Types of freezing systems available; freezing and using meats, poultry, eggs and fish; freezing fruits and vegetables; containers for frozen foods; general precautions and directions for freezing fruits and vegetables; serving or cooking frozen fruits and vegetables; list of important factors in freezing foods which pertain to use and type of locker storage suitable for the individual.

F. F.

(416) Brady, D. E., Frei, P. and Hickman, C. W., "Effect of Freezing Rate on Quality of Frozen Meats." Food Res. 7, No. 5, 388-93 (1942). - Quick-freezing at -15° F. and slow-freezing at 0° F. Slow-frozen (0° F.) pork, lamb and beef had a higher evaporation rate during storage than quick-frozen (-15° F.). The smallest cooking loss occurred in quick-frozen steaks broiled while frozen; thin cuts should be cooked without thawing. Palatability was not affected.

B. A. 17, 1165 (1943).

(417) Brady, D. E., Frei, P. and Hickman, C. W., "Quick Freezing of Meat." Modern Refrig. 46, No. 539, 37-8 (1943). - Determination of effect on quality; different cuts; test equipment; broiling after storage. From "Food Res." date not specified.

E. I. 1943, 897.

(418) Brandt, H. G., "Methyl Chloride - An Expedient Substitute." Refrig. Eng. 46, No. 5, 301-4 (1943).

(419) Bray, R. W., Vail, G. E., and Mackintosh, D. L., "Influence of Freezing on the Tenderness in 'Aged' Beef." Trans. Kansas Acad. Sci. 44, 327-31 (1941). - The results to date indicate little or no change in tenderness of "aged" beef due to freezing; however, indications were that this may vary with the animal. Considerable variation was found in the tenderness between animals. The posterior section of the short loin was found to be more tender than the anterior section. Considerable variation exists among the cores taken from the longissimus dorsi muscle. The greatest variation occurred in the lateral core. The right side was found significantly more tender than the left side, but as yet no satisfactory explanation can be submitted.

B. A. 16, 913 (1942).

(420) Brewster, J.A., "Quick Freezing of Beef in Quarters." Inst. Refrig. Proc. 40, 133-41, 142-6 (1943-44). - Cf. Modern Refrig. 47, No. 553, 83-4, 104 (1944). Details of freezing plant and temperatures and pressures used, together with savings in space as against other systems of freezing; freezing time.

E. I. 1944, 891.

(421) Bridston, M. E., "Cold-Pack Industry Growing." Refrig. Eng. 33, No. 6, 379-81 (1937). - Extent of growth of cold pack industry in Washington and Oregon; methods used; advantageous location of plants near producing sections.

E. I. 1937, 980.

(422) Bridston, M. E., "Interesting New Freezer Installed at Port of Seattle." Refrig. Eng. 36, No. 4, 244-5 (1938). - New system of decentralized tray freezing installed at Spokane Street Terminal of Municipal Port, described; installation, applying principle of forcing air through trays of product, differs radically from ordinary method of tray freezing.
E. I. 1938, 1023

(423) Brooks, F. T., "Molds on Frozen Meats." J. Soc. Chem. Ind. 43, 306T (1924). - Brooks referred to a statement by Wright (C. A. 13, 719) that "black spot" of cold storage meat was due not only to Cladosporium herbarum but also to Mucor mucedo and Penicillium glaucum. This statement conflicted with results previously published by Brooks. Brooks repeated some of his experiments and could find no evidence to support the statement that Mucor mucedo and Penicillium glaucum could cause "black spot." He confirmed his former statement that "black spot" was due to Cladosporium herbarum.
C. A. 19, 685 (1925).

(424) Brooks, J. "Effect of Freezing in a Concentrated Solution of NaCl on the Color of Red Muscle." Biochem. J. 24, 1397-83 (1930). - Differences between the results of air freezing and brine freezing are due to the penetration of sodium chloride into the tissue. This penetration influences the oxidation of hemoglobin into methemoglobin by increasing the rate of oxidation, and by increasing the depth of the superficial layer of tissue in which oxidation is possible.
C. A. 25, 731 (1931).

(425) Brown, E. B., "Bacterial Studies on Defrosted Peas, Spinach, and Lima Beans." J. Home. Ec. 25, 837 (1933). - History and data of previous work done on bacterial flora and survival in frozen foods. Report of experiments carried out on fresh and frozen spinach, peas, and Lima beans to determine numbers and species of bacteria present. Bacterial counts were higher and spoilage quicker in the frozen products.
F. F.

(426) Brown, H. D., Short, R. M., and E. K. Alban, "SO_2 vs. Blanching as an Agency for Inactivating Peroxidase and Catalase for Dehydrating and Freezing." Proc. Am. Soc. Hort. Sci. 44, 193-5 (1944). - In preliminary tests sulfur dioxide treatments of carrots, potatoes, collards and spinach did not give as satisfactory a dehydrated product as steam blanching. Collards and spinach retained more vitamin C under sulfur dioxide treatment than with steam blanch. Pimento peppers yielded a good product as did peaches and apples.
C. A. 38, 5017 (1944).

(427) Brown, H. D., "Proper Blanching Assures Good Results." Quick Frozen Foods 6, No. 6, 50-4 (1944). - Emphasis is put on the importance of inactivating enzymes in vegetables intended for preservation by freezing. Blanching (scalding) in steam is preferred - as it avoids loss of water soluble constituents. Storage in the neighborhood of 0° F. (-18° C. approximately) is advocated. Varieties of vegetables and fruits found suitable for freezing are listed. These include asparagus variety Martha Washington; snap beans varieties Giant Stringless, Green Pod, Green Refugee, and Kentucky Wonder; peas varieties Thomas Laxton, Improved Gradus, Dark

Podded Telephone; strawberries varieties Premier, Dorset, Chesapeake; red raspberries varieties Cuthbert, Viking, Latham, etc. Preparation for freezing is discussed.

B. A. 18, 1571 (1944).

(428) Brown, M. W., "Merchandising of Frozen Foods in Locker Plants." Ice and Refrig. 100, No. 6, 461-2 (1941). - How locker plants may successfully compete with new domestic deep freeze cabinets; distribution methods.

E. I. 1941, 262.

(429) Brunell, H.J. Esselen, W.B. Jr. and Griffiths, F.P., "Methods for Quick Freezing and Dehydrating Mushrooms." Food Industries 15, 74-5 (1943). - Investigation to study methods for dehydration and quick freezing of commercially grown mushrooms (Agaricus Campestries); information was also obtained on effect of these methods of preservation on vitamin content of mushrooms. Contrib. No. 485, Mass. Agric. Experimental Station, Amherst Mass.

E. I. 1943, 427

(430) Brunner, M. A. "German Arrangements for Importing Storing and Distributing Frozen Meat." Ice & Cold Storage 26, No. 305, 189-91 (1923). - Developments since war.

E. I. 1923, 168.

(431) Bryan, J. E., "Quick Freezing of Meat by New Low Cost Method." Ice & Refrig. 94, No. 4, 297-8 (1938). - Something new and different in quick freezing equipment used by Gobel and developed by author, is Dry-ice freezer built by company mechanics and carpenters at cost of $8,000; quickly freezes meat at cost of less than ½ cent per pound and has capacity of 1000 pounds meat per hour.

E. I. 1938, 1024.

(432) Bryce, F. W., "Distribution Hurdles in Quick Frozen Foods." Food Ind. 2, No. 6, 250-54 (1930). - Advantages of quick-frozen foods; changes which take place in foods; perfection of silica-gel refrigeration freight cars; developments of Atlantic Coast Fisheries Co.

E. I. 1930, 748.

(433) Buchner, H., "Use of Cellophane in Packaging Frozen Foods." Zeit fuer die Gesamte Kaelte-Industrie 47, No. 11, 151-2 (1940). - Use of cellophane in frozen food products; its suitability for packing of frozen food products is established, but question of most suitable form in which it should be applied has not been determined and further research is necessary.

E. I. 1941, 866.

(434) Buck, R. E., Baker, G. L., and Mottern, H. H., "Pectinates Improve Frozen Fruit." Food Industries 16, No. 2, 100-2 & 134 (1944). - Pectinates are effective in reducing the amount of juice draining from fruit on thawing and in improving the appearance of the fruit. The characteristics of pectinates do not seem to exert a great deal of influence on their action. Different samples of pectinates covering a wide range in ester content wor-

ked equally well whether acid or enzyme demethylated of high or low gel power, or of high or low calcium content.

C. A. 38, 1577 (1944).

(435) Budd and Diehl, "Frozen Foods Survey." Good Packaging 6, No. 4, 15-17 & 34-35 (1945).

(436) Buel, E.I. Preparation of Frozen Foods. Purdue University Div. of Home Ec., 1940. - Deals with utilization.

E. B.

(437) Buel, E.I. Freezing Fruits and Vegetables. Purdue Univ. Div. of Home Ec., 1941.

(438) Bull, S., "The Effect of Methods of Freezing Upon Quality of Pork." Quick Frozen Foods 6, No. 2, 40-6 (1943). - Experiments indicate that for all practical putposes still freezing, plate-freezing and blast freezing are all satisfactory from the standpoint of quality of product. Pork properly wrapped and frozen may be stored at 0° F. for sixteen weeks without appreciable impairment of quality. B. A. 18, 1189 (1944).

(439) Bull, S., "Post-War Problems of the Locker Industry." Refrig. Eng. 46, No. 5, 310-11 & 364 (1943).

(440) Bullis, D. E. and Wiegand, E. H., "Blanching Experiments on Frozen Corn-on-the-Cob." Fruit Prod. Jour. 24, No. 12, 361-67, 377 (1945). - From the extensive experimental work on the enzyme activities of corn-on-the-cob blanched and otherwise treated in various ways, the following conclusions were drawn: (1) temperatures below that of boiling water are unsuitable for blanching ear corn for frozen packs of corn-on-the-cob, because of the overcooking required to inactivate the enzymes in the center of the cob; (2) addition of salt or adjustment of pH of the blanching or cooling water did not reduce the time required for blanching, but tended to toughen and affect the natural flavor of the product; (3) a one-half inch hole drilled longitudinally through the cob allowed rapid access of blanching water or steam to the center portion of the ear and permitted satisfactory enzyme inactivation in at least two minutes less than otherwise required. To minimize or prevent tearing of the kernel structure by the drill, ears should be at least 1½ inches in diameter and should not taper sharply toward the tips. The benzidine test gives a better idea of the amount of peroxidase in corn than the guaiac test. Tests for peroxidase should be made on the cob tissue rather than on the kernels because it contains more and it is also most difficult to heat during blanching.

B. A. 20, 186 (1946).

(441) Burk, E. F., "Freezing Studies with Sweet Corn Varieties in Eastern Washington." Proc. Ann. Doc. Hort. Sci. 35, 725-7 (1937). - Problem: to determine the most desirable varieties of vegetables (expecially sweet corn for freezing; the qualities desirable in vegetables for canning and those for freezing are not always the same. Procedure. Discussion. One table: "Suitability of Sweet Corn Varieties in Eastern Washington for Frozen Pack."

B. J. W.

(442) Burton, L. V., "How Fillets are Frozen by the Cooke Method." Food Ind. 2, No. 4, 152-54 (1930). - Highly specialized developments embodied in Groton, Conn., plant of Atlantic Coast Fisheries Co.; Taylor process of treating fish fillets previous to freezing operation; Cooke system of fish freezing.

E. I. 1930, 1499.

(443) Burton, L. V., "Florida Produces Frozen Orange Juice." Food. Ind. 3, 208-11 (1931). - The methods of freezing orange juice are described briefly in this article. Methods of protecting the juice from oxidative processes by as complete removal of the air as is possible before freezing, are utilized. E. M. F.

(444) Burton, L. V., "Quick Freezing." Food. Ind. 7, No. 7, 326-8 (1935). Cf. Ice and Refrig. 89, No. 4, 215 (1935). Details pertaining to Birdseye multiplate freezer; how it compares with canning in preservation of fruits and vegetables.

E. I. 1935, 912.

(445) Burton, L. V., "Quality Separation by Differences of Density, I, II, III." Food Ind. 10, 6-9, 56-8, 68-70, 114-6, 136-8 & 170-2 (1938). - Quality control is achieved in many ways. In the method discussed here it is put into effect by automatic separation of raw materials into two streams having different properties or values. In principle, the method discribed is one of automatic separation of substances which have very slight differences of specific gravity or density.

F. F.

(446) Burton, L. V., "Birdseye Demonstrates New 20 Plate Froster." Food Industries. 13, No. 11, 56-7 (1941). - High capacity, continuous quick freezer automatically controls rate of feed to attain constant predetermined temperature of frozen products; has conveyor feed and discharge and fits into production line; illustrations given.

E. I. 1941, 1025.

(447) Buskirk, H. H., Bacon, W. E., Tourtellote, D., and Fine, M. S., "Stability of Vitamin C in Frozen Orange Juice During Prolonged Storage." Ind. & Eng. Chem. 25, 808-10 (1933). - Author's conclusions: the vitamin C potency of properly frozen orange juice does not deviate essentially from that of fresh orange juice. No consistent or important change in vitamin C content occurs during the storage of orange juice in the frozen condition at -15° F. (-26.1° C.) for periods of at least 20 months.

F. F.

(448) Buttenberg, P., "Judging Frozen Foods and Their Semi-Manufactured Products." Z. Untersuch Lebensen 58, 144-65 (1929). - Ice cream, ices, etc. are discussed. C. A. 24, 1908 (1930).

(449) Byfield, A. L., "Air Circulation Problems." Refrig. Eng. 45, No. 6, 417-8 (1943). - Specifications given for proper conditions for air conditioning of holding rooms for meat storage, and for meat chill rooms.

F. F.

(450) Bystrov, S.P., "Variations in the Physiochemical Properties of Meat During Freezing and Storage." Myasnaya Ind. 9, No. 7, 32-3 (1938). - Freezing meat and storing it at low temperatures increase its electrical conductivity, viscosity and density of extracts, and decrease the surface tension. These processes do not involve any deep-seated decomposition or degradation of the proteins. The modifications depend chiefly on the aging of the proteic colloids of the meat.

C. A. 33, 3474 (1939).

(451) Bystrov, S. P., "Swelling of Quick-Frozen and Slow-Frozen Meats." Kholodil'naya Prom 17, No. 1, 41-2 (1939); Chimie & Industrie 42, 801 (1939). - Quick-frozen meat swells more than slow-frozen meat. It can be deduced that quick-frozen meat undergoes less change than meat which has been frozen progressively. When frozen meat is swollen in buffer solutions, equilibrium is reached in 24 hours. Myasnaya Ind. 9, 32 (1938).

C. A. 34, 2944 (1940).

(452) Caldwell, J.S., Lutz, J.M., and Moon, H.H., "How to Get Better Quality in Frozen Peaches." Food Ind. 4, 402-405 (1932). - The work here reported was undertaken primarily to obtain information in regard to dessert quality and appearance of the frozen ready-to-serve products obtained from a considerable number of varieties of peaches. The secondary purpose in the work was to obtain information as to the effects of stage of maturity of fruit, type of container, concentration of syrup, rate of freezing, method and rate of defrosting, and time elapsing, between defrosting and consumption upon appearance and quality of the product.

E. M. F.

(453) Caldwell, J.S., Lutz, J.M., and Moon, H.H., "Varietal Behavior of Strawberries and Peaches Preserved by Frozen Pack Methods." Proc. Am. Soc. Hort. Sci. 29, 282-6 (1932-33). - A comparison is made among 18 varieties of peaches and 64 of strawberries as to color, odor, texture and flavor after freezing and thawing in hermetically sealed cans and in non-airtight paper containers. Instances are given to show that rapid freezing and paper containers favor loss of color, odor, and flavor of some fruits.

B. A. 8, 2272 (1934)

(454) Caldwell, J.S., Lutz, J.M., Moon, H.H., and Myers, A.T., "Varietal Adaptability of Peaches to Freezing in Small Consumer Packages." Fruit Prod. J. 12, 366-71 (1933). - Wide differences in variety adaptability to freezing. Comparative study of 56 varieties frozen in 1932. Nine varieties regarded as superior: Chairs, J. H. Hale, a smooth variant of J. A. Hale, Reeves, Up-to-Date, St. John, Eclipse, Oriole, and Primrose. Those which were not of such high grade but would be acceptable according to existing market standards included Al, Brackett, Early Crawford, Late Crawford, Slappey, Roberta, Rosalind, and an unnamed seedling selected by W. F. Wight. Comparative studies of effects of slow and rapid freezing at varying temperature and in non-airtight containers were made. Best preservation of color was by slow freezing at higher temperatures. This difference is not noted in sealed containers.

F. F.

(455) Caldwell, J.S., Lutz, J.M., Culpepper, C.N. and Moon, H.H., "Corn for Freezing - A Study of Comparative Suitability for Freezing Purposes." Canner 83, No. 6, 11-13, 20; No. 7, 11-14, 16 & 32; No. 8, 15-16; No. 9, 13-14 28 (1936).

(456) Caldwell, J.S., Lutz, J.M., and Moon, H.H., "Suitability of Lima Beans for Freezing." Canning Age 17, 373-8; 393-5 (1936).

(457) Caldwell, J.S., Lutz, J.M., and Moon, H.H., "Frozen Succotash." Canning Age 17, 414-6, 449-51, 472 (1936).

(458) Caldwell, J.S., Lutz, J.M., Moon, H.H., and Culpepper, C.W., Comparative Studies of Varietal Suitability for Frozen Preservation of Peas,

Green or Snap Beans, Lima Beans, and Sweet Corn Grown Under Eastern Conditions. U.S. Dept. Agric. Tech. Bull. No. 731, 1940. pp. 1-72. - 18 Varieties of peas, 14 of green beans, 8 of lima beans and 35 of sweet corn were used in work continued over two seasons. Material was examined after 6 to 7 months' storage at 0°F. Each of the crops, except corn, showed wide range in appearance and quality, the varieties ranking from excellent to definitely unsuitable for freezing. Of green beans, Giants, Stringless Green Pod, Mosaic-Resistant Stringless Green Refugee (Idaho Refugee), and Kentucky Wonder Pole seemed exceptionally promising for freezing. Of the peas studied, Thomas Lexton and Asgrow No. 40 were superior, all factors considered. Of the lima beans, the 2 pole varieties, Giant Podded and King of the Garden, with the potato type Dreer Bush, were superior in that they retained fresh, attractive green color and excellent texture and flavor at all stages up to full size. Other varieties required exclusion of the larger sizes because of loss of color and flavor and development of starchiness. At suitable and identical stages of maturity, differences in quality between sweet corn varieties were much smaller than those in other crops. Ten varieties were grouped as having highest quality, with no attempt to rate them in order of excellence: Bantam Evergreen, Bantam Evergreen Hybrid, Golden Bantam, Improved 10-14,-Rowed Golden Bantam, Top Cross Bantam, Top Cross Whipple Yellow, Money Maker, Narrow Grain Evergreen, Stowell Evergreen, Stowell Evergreen Hybrid 14 X5. Since corn and beans in various mixtures preserved their characteristic flavor and quality to the same degree as when frozen separately, freezing of succotash is a possibility. Peas, lima beans, and sweet corn showed somewhat better preservation of freshness and natural color in brine when examined in the frozen condition, but no difference in appearance, color or quality when cooked. Straight packed green beans were superior in appearance to brine packs when frozen, but the reverse was true after cooking. Differences in appearance of material preserved in hermetically sealed and non-airtight containers were very slight after 6-8 months, but hermetically sealed material was superior in appearance and quality after 18 months. Storage for 6 months at 15°F. resulted in pronounced changes in appearance, flavor and general quality of the material, which in many cases became inedible.

B. A. 15, 1201 (1941).

(459) Callow, E. H., "The Velocity of Ice Crystallization Through Supercooled Gelatin Gels." Proc. Roy. Soc. London 108A, 307-323 (1925). - Method for measuring velocity of ice crystallization in supercooled gelatin gels; experimental data indicating that concentration of gel inversely proportional to velocity of crystallization; tests made with variations in pH through addition of HCl, H_2SO_4 and NaOH, and with variations in neutral salt content - all affect formation of crystals; opaque gels shown "to offer less resistance to the penetration of a falling body than clear ones containing the same concentration of gelatin." Also tests with velocity of ice crystallization through gels containing less than 2.5% gelatin; and tests with boiling gelatin solution prior to supercooling which indicated that B gelatin does not retard the velocity of ice crystallization to the same extent as normal gelatin. F. F.

(460) Callow, E. H., Freezing and Storage of Pork and Mild Cured Bacon. Sci. Ind. Research Rept of Food Investigation Board, 1930. pp. 17-4. - The use of whale oil in the diet of pigs produced in 2 cases softness and rancidity of the fat in the resulting pork. Freezing at -35°C. and storage at -10°C. are effective for the muscle but not for the fat of the mild

cured bacon, which is difficult to store satisfactorily.
C. A. 25 4944 (1931).

(461) Commerer, I.S. "The Requirements of Insulation for Cold Room." Zeit Fuer die Gesamte Kaelte-Indust. 45, No. 5, 88-91; 46, No. 8, 141-5.

(462) Camp, A F., Traub, H P., Gaddum, L.W., and Stahl, A.L., Type, Variety Maturity and Physiological Anatomy of Citrus Fruits as Affecting Quality of Prepared Citrus Juices. Fla. Agric. Exp. Sta. Bull. 248, 1932.

(463) Campbell, H. "Undesirable Color Changes in Frozen Peas Stored at Insufficiently Low Temperatures." Food Research 2, 55-7 (1937). - The factor responsible for the loss of green color in frozen pack peas stored at insufficiently low temperatures is essentially the slow transformation of chlorophyll into pheophytin, as a result of the action of the acids present in the cell sap. It also seems probable that peas subjected to the action of lactobacilli before freezing are likewise discolored by the action of the lactic acid developed during fermentation.
C. A. 31, 5051 (1937)

(464) Campbell, H. and Diehl, H.C., "Effects of Handling Methods on Quality of Frozen Peas." Western Canner and Packer 29, No. 11, 18, 19, 22-4 (1937).

(465) Campbell, H., "Notes on the Tenderometer." Western Canner and Packer. 31, No. 6, 113-4 (1939).

(466) Campbell, H., "Scalding of Cut Corn for Freezing." Western Canner and Packer 32, No. 9, 51-5 (1940). - Under experimental conditions, scalding cut sweet corn for 60 seconds at 160°F. was adequate for quality retention during freezing storage at -5°F. For commercial conditions, a scald of 1 minute at 180°-200°F. is recommended. Quality is better if scalding is carried out before cutting the kernels from the cob. The quantitative test for catalase activity in scalded cut corn is not sufficiently reliable to warrant its use as an index to scalding efficiency. The quantitative peroxidase test for adequacy of scalding is a useful index of scalding efficiency.
C. A. 35, 220 (1941)

(467) Campbell, H and Diehl, H C., "Quality in Frozen Pack Peas." Western Canner and Packer 32, No. 11, 51-3 (1940).

(468) Campbell, Horace, Lineweaver, H., and Morris, H.J., "Severe Blanch Doesn't Improve Dehydrated Potato Quality." Food Indust. 17, No. 4, 384-6, 478-84 (1945). - Severe blanching does not improve storage quality of dehydrated white potatoes. Peroxidases are of little moment. Storage below 70°F. does not markedly affect quality deterioration, at 90° a water-soluble pigment develops.
B. A. 19, 2177 (1945).

(469) Campbell, H., "Some Fundamentals of Vegetable Preservation by Freezing." Western Frozen Foods 6, No. 8, 3-5 (1945).

(470) Candle, F. W. and Boggs, M., "Measuring Texture of Frozen Peas." Western Canner and Packer 33, No. 8, 44-6 (1941). - Diagrams and discussions of two types of apparatus for testing texture of frozen peas.
F. F.

(471) Carlton, H., Frozen Pack Fruit Market, Tennessee Agriculture Experiment Station, Bulletin 161, 1937.

(472) Carlton, H., "Some Commercial Aspects of Frozen Food Industry." Refrig. Eng. 36, No. 5, 291-4 (1938). - Study of distribution and probable future market. Before Food Preservation Conference, Univ. Tenn.
E. I., 1023 (1938).

(473) Carlton, H., The Frozen Food Industry. Tenn. Agric. Exp. Sta. Bull. No. 173, 1941. 175 pages.
B. A. 15, 2059 (1941).

(474) Carlton, H., "Quick Frozen Foods and Refrigeration." Refrig. Eng., 41, No. 5, 328-9, 358-60 (1941). - There are now 4000 freezer-locker plants in operation; author points out, emphasizing fact that this rapidly growing new industry needs cooperation of refrigeration engineer and equipment engineer in every operation; speed of freezing, precooling methods; maintenance of uniform zero degree temperature from freezer to consumer; these and other problems must be solved. Before Am. Soc. Refrig. Engrs.
E. I., 1026 (1941)

(475) Carlton, H., Home Preparation of Fruit- and Vegetables for the Freezer Locker. U of Tenn. Ag. Exp. Sta. Bulletin No. 168, 1942. 14 pages.

(476) Carlton, H., "Factors Affecting Quality of Frozen Foods." Refrig. Eng. 43, No. 4, 205-8, 245 (1942). - Selection of suitable varieties for planting, harvesting at optimum maturity, careful grading and protection of fresh foods throughout processing operations are important factors for both quick frozen food industry and freezer locker operations; freezing methods often cannot be blamed for low quality products. Before Univ. Tennessee, Food Preservation Conference, October, 1941.
E. I., 922 (1942).

(477) Carrick, D.B. Some Effects of Freezing on Mature Fruits of the Apple. Cornell U. Agric. Exp. Sta. Mem. No. 81, 1924.

(478) Carrick, D.B. The Effect of Freezing on the Respiration of the Apple. Cornell U. Agric. Exp. Sta. Mem. 110. 1928.

(479) Carrick, D.B. The Effect of Freezing on the Catalase Activity of Apple Fruits. Cornell U. Agric. Exp. Sta. Mem. 122, 1928.

Move Item (471) down two lines. F. F.

(480) Carrick, D.B. Some Cold Storage and Freezing Studies on the Fruit of the Vinifera Grape. Cornell U. Agric. Exp. Sta. Mem. 131, 1930.

(481) Carroll, T. J. "A Kolbe Installation at Gordon-Pew Plant." Food Industry 2, 169-72 (1930). - New plant at Gloucester, Mass., which is devoted entirely to production of quick fillets; description of equipment and operation procedure. E. I. 1930, 1498.

(482) Carson, F.T., "Passage of Moisture Through Packaging Materials." Food Indust. 10, No. 1, 14-16 (1938). - Ten factors which influence loss or gain of moisture in packaged foods discussed.
E. I. 1938, 859.

(483) Carson, F T., "Testing Packaging Materials for Permeability to Moisture." Food Indust. 10, No. 3, 130-2, 170 (1938). - Supplement to article indexed from issue of January, 1938; further discussion of factors affecting penetration of moisture through food wrappings; how to test materials for moisture permeability; moisture permeabilities of various materials.
E. I. 1938, 859.

(484) Carson, R., "Big Freeze Coming." Colliers 116, No. 2, 21, 55 (1945). A discussion of the frozen foods business, the important developments being made and what this will mean to the household of the present and future. The article illustrates some of the practices with frozen foods being made and experimented with by certain establishments.
E. M. G.

(485) Carver, W., "Frozen Food Locker Industry." Refrig. Eng. 44, No. 3, 147-50, 202, 204 (1942). - Comprehensive analysis of development of locker plant industry stressing its importance in present wartime period; savings in critical materials that can be made if quantity of frozen foods is increased, if farmers are permitted to continue to use their lockers, actual transportation savings will be effected.
E. I. 1942, 237.

(486) Carver, W., "The Home Locker." Refrig. Eng. 46, No. 3, 157-61, 179; No. 4, 237-9, 268 (1943).

(487) Cass, T.F., Jr., "Custom Tailored Packaging." Quick Frozen Foods 4, No. 1, 16-17, 31 (1941). - "Custom tailored packaging for frozen foods required careful analysis of packaging materials, styles, and sizes in relationship to the individual packer's type of product and methods of processing, freezing and distribution, in order to obtain the necessary requirements of product protection, economy and merchandising appeal."
Author's Abstract.

(488) Cathcart, W.H. and Tuber, S.V., "Freezing as a Means of Keeping Bread, Including Physical and Organoleptic Tests." Ice and Refrigeration 95, 212 (1938). - According to swelling-power tests bread salted very rapidly at temperatures as low as -22°. At -35° the bread kept in its ori-

ginal fresh condition for a period of 4 days and required 8-10 days to become nearly stale. The tests were continued for 60-70 days and a refreshing of the bread occured. According to aroma and taste tests, bread frozen at -22° remained "good" for 20 days and "salable" for 40 days. At lower temperatures the bread remained in a "salable" condition for longer periods. At -22° CO_2 in the freezing chamber did not improve the keeping quality. The pH of the bread either did not change or slightly increased on remaining in the freezer.

C. A. 32, 9308 (1938).

(489) Cathcart, W., "Food Thawing With High Frequency Heat." Elec. World 123, No. 21, 128, 130 (1945); Western Canner and Packer 37, No. 7, 56 (1945). - Savings in time and reduction of spoilage are suggested by experiments of Dr. William Cathcart for A&P Stores and Federal Telephone & Radio Corp. Large cartons of foods are thawed by electronic heat through uniform quick heating. Thawing time varies with product, has been applied to fruits and berries, eggs, bakery products. When fruits and berries are thawed in this manner, firmness persists.

F. F.

(490) Chase, E.M. and Poore, H.D., "Quick Freezing Citrus Fruit Juices and Other Fruit Products." Ind. Eng. Chem. 23, 1109-12 (1931). - Replacing the air in the head space above the juices or washing out dissolved air with CO_2 has no marked effect on the flavor of the juices. Too much CO_2 produces an off flavor. Frozen fruits are slightly improved by CO_2.

C. A. 25, 5939 (1931).

(491) Chase, E.M. and Poore, H.D., "Quick Frozen Pineapple Juice." Cold Storage 35, No. 417, 274 (1932). - Successful results of recent experiments; solid CO_2 as refrigerant; temperatures of crushed pineapple in 8 oz. can during quick freezing and defrosting at room temperature.

E. I. 1932, 1111.

(492) Chase, E.M. and Poore, H.D., "Rapid Freezing of Citrus Fruit Juices." Ice and Cold Storage 36, 32-4 (1933). - Quick-frozen citrus fruits retained their flavor over extended storage periods. Use of vacuum or CO_2 in the canned frozen juice did not appear to have any marked effect on the flavor of the juice. Too much CO_2 gave the juice an off flavor. With frozen fruit, however, the use of CO_2 resulted in a more satisfactory product after storage than when CO_2 was not used. Open freezing and freezing in friction top cans were not recommended unless precautions were taken for storage out of contact with air.

C. A. 27, 4318 (1933).

(493) Chase, E.M., "Preserving the Dietitic Value of Frozen Foods." J. Am. Dietet. Assoc. 16, 34-8 (1940). - A discussion.

C. A. 34, 2077 (1940).

(494) Chase and Sullivan, "Aluminum Foils for Frozen Food Packaging." Good Packaging 6, No. 8, 11-12 (1945).

(495) Charley, V.L., Investigation on Fruit Products. V. The Concentration of Fruit Juices by Freezing With Special Reference to Apple Juice. Ann. Rept. Agric. and Hort. Sect. U. of Bristol, 150-61 (1935-36). - Apple juice concentrated by freezing and removal of ice had a better flavor than juices concentrated by vacuum evaporation. The alcoholic content of apple ciders could be nearly doubled by this method.

B. A. 11, 9141 (1937).

(496) Churnley, F. and Young, O.C., "The Effect of Freezing and Thawing on the Quality of Canned Herring." Canadian Jour. Res. Sect. D. Zool. Sci. 21 No. 1, 8-17 (1943). - Repeated freezing and thawing definitely impair quality by causing absorption of a portion of the free aqueous liquid and free oil into the interior and seriously diminishing the firmness of the cooked tissue.

B. A. 17, 1165 (1943).

(497) Child, A.M. and Fogarty, J.A., "Effect of Interior Temperatures of Beef Muscle Upon the Press Fluid and Cooking Losses." J. Agric. Res. 51, 655-662 (1935); Scientific Journal Series, Minnesota Agric. Exp. Sta., Paper No. 1343 (1935). - A method for studying the quality and quantity of press fluid or juiciness in different meat samples has been developed through the use of the pressometer. The term "press fluid" is used to designate the fluid, consisting of moisture plus the soluble material plus the colloidal fraction, expressed from muscle by the use of the pressometer. This paper deals with a study of the quantity and composition of press fluid from beef muscle heated to different temperatures to determine their effect on the palatability of meat with respect to juiciness, a very important factor in meat quality.

E. M. F.

(498) Child, A.M. Thawing and Cooking Frozen Meats. Minnesota Agriculture Experiment Station Special Bulletin No. 189, 1937.

(498A) Child, A M. and Paul, P. Effect of Thawing and Cooking Frozen Pork and Beef. Minnesota Agriculture Experiment Station Technical Bulletin No. 125, 1937.

(499) Child, A.M. and Niles, K.B., Food Preparation Studies. Second Edition. London: Chapman & Hall.

C. A. 33, 1407 (1939)

(500) Chizhov, G.B., "The Conditions of Crystal Formation in the Freezing of the Moisture in Food Products." Kholodil 'naya Prom 18, No. 1, 12-15 (1940). - A criticism is offered of the objections of Bardach, (cf. Bardalah, E.Y., Kholodil 'naya Prom. 5, 15, 19 (1937).) to earlier assumptions regarding the nature of the crystal formation in the rapid cooling of foods. The previously assumed relation between the rate of freezing and the character of crystal formation does not exist. Supercooling cannot be assumed because of the presence of crystallites in the air even if care is exercised to exclude sublimed crystallites. Aside from the rate of cooling, the cause of the formation of large or small ice crystals is probably to be found in the histological structure of the food.

C.A. 36, 7151 (1942).
C.Z. II, 3120 (1940).

(501) Clark, E.D., Almy, L.H. and Pennington, M.E. The Commercial Freezing and Storing of Fish. U. S. Dept. Agr. Bull. No. 635, 1918. p. 10. - The bulletin gives a description of the best methods of freezing and storing fish. Fish kept in the frozen condition for 27 months showed no changes which rendered them unsuitable for food.

C. A. 12, 1573 (1918).

(502) Clark, E.D. and Almy, L.H., "Chemical Study of Frozen Fish in Storage for Short and Long Periods." J. Indust, & Eng. Chem. 12, 656-63 (1920). - Studies made on keeping quality of frozen fish and chemical (nutritive) changes which occur during freezing and storage.

F. F.

(503) Clark, J.H. Preservation of Food Products by Freezing. N. J. Agric. Exp. Sta. Circ. 461, 1943. 20 pages. - Freezing equipment, edible and storage qualities of frozen foods; low temperatures required; preparation of foods for freezing (fruits, use of sugar, preparation of specific fruits, vegetables , vegetables must be blanched, quick cooling is necessary, preparation of specific vegetables, poultry, rabbits and other small game, eggs, meat products, fish and shell fish); packages for frozen foods; preparation of frozen foods for cooking; special precautions.

B. A. 17, 2277 (1943).

(504) Clark, J.H., "Fruit Varieties Suitable for Quick Freezing." The Frozen Food 26, No. 10, 66-7 (1945). Tests carried out at New Jersey Experiment Station since 1942 to determine adaptability of fruit varieties to quick freezing. "Role of Sugar" and "Low Acid Varieties" discussed. Tentative Rating of Fruit Varieties For Freezing (a table).

B. J. W.

(505) Clark, J.T. and Philipson, P.M., "The Cold Storage of Fish." Food Technology 1, 153-4 (1931). - The greater part of the adverse change complained of in frozen fish is due to prolonged storage rather than to the freezing. From the common point of view, the time during which fish can be stored at or about -10° is limited only by desiccation and discoloration due to oxidation of the fats. Freezing alone is inadequate to explain the phenomenon of "drip" and loss of condition, and it is assumed that chemical chamge, possible of enzymic origin, is responsible for the deterioration.

C. A. 26, 4387 (1932).

(506) Classen, T.E.A., "Influence of Modern Refrigeration on Marketing Perishable Foods." Ice & Refrig. 80, No. 3, 261-262 (1931); No. 4, 355-359 (1931). - In the first article it is stated that change in food habits of people brings increased demand for meat products; development of frozen-meat industry; difference between chilled and frozen products: In the second, slow air and rapid brine-freezing methods are compared and effects of each are given; fish freezing methods are applied to other products. Before S. African Economic Soc.

E. I. 1931, 1205.

(507) Clayton, W. Colloid Aspects of Food Chemistry and Technology. Philadelphia: P. Blakiston's and Son. Inc., 1932.

(508) Clore, W.J., "Lima Beans and Green Edible Soybeans for Freezing From Central Washington." Western Canner and Packer 37, No. 3, 51, 52, 61 (Mar. 1945). - Lima beans rank second among frozen vegetables. Not as well known is the green soybean, but they are similar and somewhat better in flavor and are higher in nutritional value. Of all methods of preparing green soybeans, freezing undoubtedly yields best quality. Also discussed are varietal differences, seeds, etc.

F. F.

(509) Coe, F.M., "Red Raspberry Varieties for Freezing, Local Market and Home Use." Farm & Home Sci. 5, No. 2, 3-11 (1944). - A discussion of raspberry varieties in Utah and for what purpose they are best suited. Of the varieties mentioned, N. Y. Station Nos. 1443 and 8126 were promising, the latter, dark red and sprightly flavored was especially suited for jam making or freezing for ice cream use.

B. A. 19, 157 (1945).

(510) Coffin, R.H., "New Quick Freezing Machinery." Ice & Refrig. 94, No. 3, 217-9 (1938). - Description of Smith individual machine in operation at Alabama State Docks Cold Storage and Fruit Terminal, Mobile, Ala.; production of individual frozen articles.

E. I. 1938, 1020.

(511) Cohee, R.F., "Dextrose in the Quick Freezing Industry." Quick Frozen Foods 6, No. 6, 18, 35 (1944). - The relatively low solubility of dextrose compared with sucrose makes its use inadvisable as the sole packing sugar for fruits preserved by freezing; a mixture of 20% dextrose, 80% sucrose is advantageous, assuring faster penetration of the fruit, increased firmness and higher drained weight than when sucrose alone is used. Preserves made from frozen fruit so packed exhibit superior color retention.

B. A. 18, 1702 (1944).

(512) Cole and Griffiths, "Questions and Answers of the Frozen Food Locker Industry." Locker Operator 5, No. 9, 34-5 (1944).

(513) Colella, C., "The Aseptic Antolysis of Frozen Meat." Boll. Soc. Ital. Biol. Sper. 3, 320-4 (1928). - The aim of the investigation was to ascertain whether frozen beef from America under the conditions which the consumer finds it on the market is more susceptible to antolysis than fresh meat bought likewise. Fourteen samples were tested, 7 of each. There are no substantial differences in the intensity of antolysis between fresh and frozen beef; in both 30 days after aseptic antolysis at 38° there was about 20% of the total N in solution. The curve of antolysis is the same for both kinds of beef.

C. A. 22, 3465 (1928).

(514) Colton, S.W., "Refrigerating Silver Hoarde." Refrig Eng. 34, No. 4, 213-5 (1937) - Cold storage and freezing practice in Pacific N. W. salmon industry.

E. I. 1937, 980.

(515) Conn, L.W. and Johnston, A.H., "Vitamin C Content of Frozen Orange and Grapefruit Juices." Indust. & Eng. Chem. 25, No. 2, 218-21 (1933). - The vitamin C content of commercially prepared frozen orange and grapefruit juices was equal to that of fresh juices. Storage for 5 months in frozen condition did not appreciably reduce the vitamin C potency of orange juice. Orange and grapefruit juices from which pulp was removed by centrifugation were practically equal in vitamin C potency to whole juices. The pulp obtained from 10 cc. of orange juice was insufficient. A 300 gm. guinea pig was completely protected by 1.5 cc. of orange juice or 2 cc. of grapefruit juice.

B. A. 8, 77 (1934).

(516) Conner, R.T. and Straub, G.J., "Determination of Thiamin by the Thiochrome Reaction." Ind. Eng. Chem. Anal. Ed. 13, 380-4 (1941). - Method of determination of thiamin described and results of tests for agreement with biological assays given - these showed close agreement of method described with standard biological assays. This method employs conversion of thiamin to thiochrome by oxidation of thiamin with potassium ferricyanide in alkaline solution and the subsequent measure of flourescence of thiochrome. Method tested for grains, and fresh and frozen vegetables.

F. F.

(517) Conner, R.T. and Straub, G.J., "Combined Determination of Riboflavin and Thiamin in Food Products." Ind. Eng. Chem Anal. Ed. 13, 385-8 (1941). Method described for determination of riboflavin and thiamin on same sample. Experimental data presented shows test to be valid - is in close agreement with biological assays - has been applied to grains, milk products, and fresh and frozen vegetables. Discussion of light filters (Corning glass filters) for fluorophotometer determination of riboflavin - filters 511 and 351 selected for transmitting incident light and fluorescent light respectively. See also: Ibid., pp. 380-84.

F. F.

(518) Cook, G.A., Love, E.F.J., Vickery, J.R., and Young, W.J., "Studies on the Refrigeration of Meat. I Investigations into the Refrigeration of Beef." Australian J. Exptl. Biol. & Med. Sci. 3, Part 1, 15-31 (1926). Experiments conducted to determine a method of freezing and thawing meats in which complete reversibility wa possible, i.e., no change occured in meat because of processing and subsequent thawing such as is evidenced by drip. The only method where there was no drip and no apparent distortion of cellular structure was by freezing in liquid air which gave an extremely rapid rate of freezing. Next best was freezing a small piece of meat in calcium chloride brine. The conditions, in general, found to affect the quantity of drip and the structural alteration were: rate of freezing, rate of thawing, time of storage after thawing, storage before freezing, perhaps the temperature to which meat was reduced in the freezing process and the age of the meat (younger muscle tissue appears to undergo less change than that from older beasts). Of these, rate of freezing appears to be most important.

F. F.

(519) Cook, W.H. and Sair, L., Freezing and Frozen Storage of Poultry. British Association of Refrigeration, Session 1937-38.

(520) Cook, W.H., "Some New Developments in Refrigeration and Cold Storage." Eng. J. 21, No 1, 13-6 (1938). - Discussion of advantages of "quick freezing" equipment needed and recent developments in gas storage and control of humidity in storage rooms; maintenance of low temperatures, control of conditions. Before Eng. Inst. Canada.

E. I 1938, 1022.

(521) Cook, W.H., "Precooling of Poultry." Food Res. 4, No. 3, 217-29 (1939). - Measurements of the precooling time of dressed poultry were made on a sufficient number of birds to establish equations relating the time required to the temperature gradient and the weight of the birds. Application of statistical methods showed that the precooling time was also affected by certain other characteristics of the individual birds, which was not measured. Immersion in water at 0°C. for 2 hours reduced the overall cooling time to about 60% of that required in air, but immersion in water at 7.2°C. had little effect on the cooling time and bacterial growth in water at this temperature was much higher than at 0°C. Shrinkage during precooling in air varies from $\frac{1}{4}$ to 1% being greatest for small birds. Temporary immersion in water usually resulted in a slight gain in weight, but had neither a detrimental nor beneficial effect on the subsequent retention of bloom during frozen storage.

B. A. 13, 1367 (1939).

(522) Cook, W.H., "Surface Drying of Frozen Poultry During Storage." Food Research 4, 407-18 (1939). - The rate of evaporation in poultry varies directly with the temperature and inversely with the relative humidity of the storage room. Temperatures of from -13.5°C to -22°C. were used. Humidities less than 95% were not satisfactory. Sealed, moisture resistant, but not impermeable, stocks, such as heavy waxed paper, were as effective for reducing deterioration from surface drying as an unsealed impermeable foil liner. Only the Al-foil liner prevented surface marking during storage for 1 year at -13.5°C.

C. A. 33, 8840 (1939).

(523)Cook, W.H., "Frozen Storage of Poultry. II. Bloom." Food Research 4, 419-24 (1939). - Studies undertaken to determine causes (and methods of correction of these causes) of loss of "bloom" - the fresh surface appearance of meats or poultry. General values used as an indication in studying bloom are color and opacity of superficial layers. Loss of bloom depends mainly on evaporation and thus low temperatures and high humidities preserve bloom. In water-resistant sealed packages there is little deterioration of bloom. The overall quality and initial color of poultry before freezing seems to be important factors.

F. F.

(524) Cook, W.H. and White, W.H., "Frozen Storage of Poultry. III. Peroxide-Oxygen and Free Fatty Acid Formation." Food Research 4, 433-40 (1939). - The free fatty acid content of poultry fat is usually low and shows no relation to storage conditions at freezing temperatures. The storage temperature is the most important factor in peroxide-O_2 formation in poultry fat, the amount increasing with increase in the storage temperature. At constant temperature low relative humidities accelerate peroxide O_2 formation. This seems to be due to surface drying which exposes more of the fat to the air. Even after 25 months storage at -13.5°C. the maximum peroxide-O_2 titration

observed was only about 8 ml. of 0.002 N $Na_2S_2O_3$ per gram of fat. Chicken fat is resistant to oxidation at temperatures of -13.5°C. to -18°C.

C. A. 34, 1762 (1940).

(525) Cook, W.H., "Humidification of Freezers." Refrig. Eng. 38, 229-233 (1939). - The atmosphere of a freezer must have a relative humidity of 95% or higher if surface drying of an unprotected product is to be prevented over the ordinary storage period. Preliminary experiments showed that this could be maintained only if the continuous addition of adequate quantities of water vapor to the air under conditions that prevented the formation of ice on the cooling coils. A method is described to meet these conditions.

E. M. F.

(526) Cook, W.H. and White, W.H., "Frozen Storage of Poultry. IV. Further Observations on Surface Drying and Peroxide Oxygen Formation." Can. J. Research 18D, 363-70 (1940). - Cf. Food Research 4, 407 (1939); Food Research 4, 433 (1939). A package constructed from moisture-resistant material, capable of being ventilated during chilled storage, and sealed to prevent surface drying during cold storage, is described. Results are presented to demonstrate the ability of this package to maintain the desired humidity condition. Jacketing a room to separate the cooling coils from the space occupied by the product does not prevent surfact drying of boxed goods, presumably because of the absorption of moisture by the boxes. Delays between slaughter and freezing accelerate the development of rancidity in the fat of the poultry during subsequent frozen storage, as indicated by the formation of peroxide oxygen. The free fatty acid content is not seriously affected unless the conditions prior to freezing enhance microbial development.

C. A. 35, 528 (1941).

(527) Cook, W.H., "Precooling, Freezing and Storage of Dressed Poultry." Am. Egg & Poultry Review 1, No 5, 194-8 (1940); Proc. World's Poultry Congress - 7th Congress, pp. 512-516 (1939). - Prompt precooling improves the efficiency of processing, reduces shrinkage, and inhibits growth of organisms causing spoilage. The drip obtained from minced muscle of bird precooled 24 hours, decreased as freezing rate increased. The rate of freezing appears to have no effect on the number of bacteria present, and little if any, effect of the subsequent extent of surface desiccation or visceral taint. Taint development appears to depend primarily on the period during which the product is held above the freezing point, whether it occurs during precooling, freezing, or thawing. The principal factors causing deterioration of dressed poultry stored in the frozen state; namely, freezer burn, loss of bloom, and changes in fats, are discussed in relation to different storage conditions and methods for the prevention of these defects.

B. A. 15, 1170 (1941).

(528) Cook, W.H. and White, W.H., "Effect of Temperature and Humidity on Color of Lean and Development of Rancidity in the Fat, of Pork During Frozen Storage." Can. J. Research 19D, 53-60 (1941). - Pork cuts were stored at relative humidities of 83, 87, 92, 96 and 100% and temperatures of -6.6°C -12.2°C., -17.7°C and -23°C. for 48 weeks. Visual examination revealed various degrees of surface drying under all conditions and pronounced methemoglobin formation at -6.6°C. Quantitative color measurements on both the exposed and internal surfaces of the lean showed that storage temperature

was the primary factor affecting the color. Temperature of -18°C. or lower are required to prevent these changes. Samples that had suffered the greatest color change during storage showed the least change during subsequent exposure. Temperature was also the primary factor affecting the development of rancidity in fat. Both peroxide O and free fatty acid increased significantly with increase in storage temperature, particularly between -12.2°C. and -6.6°C., but the actual quantities of free fatty acid were small and of little consequence. Storage temperatures of -18°C. or lower are essential if spoilage of pork fat is to be avoided over storage periods of approximately 1 year's duration.

C. A. 35, 2992 (1941).

(529) Cook, W.H., "Canadian Wiltshire Bacon: XVI Color and Color Stability of Pork After Frozen Storage and Conversion to Bacon." Can. J. Reasearch 19D, 85-95 (1941). - cf. C. A. 35, 2992. Temperatures below -17.7°C. (0°F.) and moisture resistant, preferably impermeable wrappings are desirable for the retention of color of pork during storage Although pork thawed in air or water was lighter in color than that thawed in brine or pickle, the difference was remarkably reduced after curing and maturation. Nevertheless, the color of the final product was significantly correlated with that of the pork after thawing. Samples stored under conditions that retain the original color, or subsequently thawed by procedures that produce light colors, are the least stable after defrosting On the average there was comparatively little difference between the color of exposed samples and internal samples, although the former was more variable. Pale-drying yielded samples with a lighter internal color than did the usual smoking procedure.

C. A. 35, 3350 (1941)

(530) Cook, W.H., "Meat Processing." Chemistry & Industry 1941, 627-30 (1941). - A detailed discussion of modern commercial methods of preserving beef, bacon, and poultry by slow and quick freezing, gas storage, smoking and curing.

C. A. 35, 7561 (1941).

(531) Cooper, A.H., "Latent Heats of Common Foods." Refrig. Eng 20, No. 2, 107 (1930). - See also Domestic England 50, No. 8, 144 (1930). - Importance of latent study of frozen-food products; method of determining latent heat values.

E. I. 1930, 748.

/(532) Costa, D. and Cannella, C., "The State of Preservation and the Tendency to Decompose of Defrozen Fish, in Comparison with Fresh Fish." Ann. Chem. Applicate 30, 402-12 (1940).

F. F.

(533) Cotton, W.P. and Fenn, F.V. Frozen Food Locker Plant in South Dakota. S. D. Ag. Exp. Sta. Bulletin No. 360, 1942. 28 pages. - Analysis of economic survey of plants in state.

E. B.

(534) Couch, R. de S., "Army Frozen Vegetable Standards." Mod. Pkging 17, 90-3 (1944).

(535) Cowe, W., "Locker Plants - Yesterday, Today & Tomorrow." Refrig Eng. 47, No. 2, 104-8 (1944) - Review of development; reasons for expansion; probably future development.

E. B.

(536) Cox, M.J. and MacMasters, M.M., "Microscopic Studies of Tissue of Frozen Fruits and Vegetables." Food Res. 7, No. 2, 135-139 (1942). - An attempt was made to determine whether the damage characteristically produced by freezing is due to the formation of ice crystals solely or whether some cell rupture is brought about by a portion of the dis olved gases being forced out of solution upon freezing. The effect of freezing in an atmosphere of nitrogen and of carbon dioxide was also investigated. Cellular breakdown seems to be due entirely to ice crystal formation. Both color and texture of peaches can be preserved by quick freezing the fruit in an atmosphere of nitrogen.

B. A. 16, 2083 (1942).

(537) Cox, R.E., "Something New in Frozen Foods. A Frozen Fruit Product for Household Jelly and Jam Making." Fruit Prod J. 24, No. 6, 169, 187 (1945). Fruit pulp of juice and just the right amount of pectin and acid are mixed and frozen. Jam or jelly is made by thawing, heating to boiling, adding a specified amount of sugar, and boiling one minute. The natural pectin content of the fruit is taken into account in calculating the proper amount to be added. Citric acid is added, when necessary to give a finished spread of pH 3.0 to 3.1. Cost estimates were very reasonable.

B. A. 19, 1363 (1945).

(538) Cox, W.F., "Peach Freezing in Georgia." Refrig. 48, No. 2, 45-48 (1930). - Plants at Monticello and Montezuma, which have capacity of 55,000 lb. daily and which will produce nearly million pounds frozen peaches during summer of 1930.

E. I. 1930, 1500.

(539) Crafts, A.S., "Some Effects of Blanching." Food Indust. 16, No. 3, 184-5 (1944). - Blanching is used in preparation of many vegetables for dehydration. The most important effect is displacement of intercellular air. Often fruits bleed after blanching, but this is offset by improvements in keeping quality and appearance.

B. A. 18, 1866 (1944).

(540) Crafts, A.S., "Cellular Changes in Certain Fruits and Vegetables During Blanching and Dehydration." Food Res. 9, No. 6, 442-452 (1944). - Observations of steam - blanching and dehydration of fleshy tissues of fruits and vegetables under the microscope were made. Fleshy parenchyma of apricot, peach, pear, and apple and of cabbage, carrot, and sweet potato is characterized by intercellular space filled with gas. If such tissue is dried without blanching, intercellular air is trapped among the cells. Steam-blanching rids the tissues of intercellular air and softens the cell walls. Steam-blanched tissue dries down in a bright, translucent condition, relatively free of intercellular air. Intercellular air restricts the free movement of moisture and heat through the tissue and hinders dehydration. Oxygen in the intercellular air in tissues may react with vita-

mins and other labile materials, lowering the quality of the product during storage. Freedom from intercellular air may serve as an index of thorough blanching. Thus translucency of the tissue is a rapid, indirect measure of the inactivation of enzymes and softening of the cell walls.
B. A. 19, 1008 (1945).

(541) Crist, J.W. and Seaton, H.L., "The Reliability of Organoleptic Tests." Food Research 6, No. 5, 529-536 (1941). - The tasting panel method for ascertaining quality in frozen pack fruits was subjected to biometric control and analysis. The mathematical procedure employed was that of correlation from ranks. The human senses of sight, taste and scent, alone and in combination, were tested for their consistency in repeated trials with the same samples. It became clear that only the sense of sight in the operators used was capable of a desirable degree of consistency in judgment. When used with either one or both of the others it was lowered from its high level, while the others were lifted from their levels--giving an immediate result that was mostly insignificant in character. B. A. 16, 481 (1942).

(542) Crocker, E.C. Flavor Transfer in Refrigerated Storage. Proc. Inst. Food Tech., 1941. pp. 195-202.
B. A. 17, 193 (1943).

(543) Crocker, E.C. Basic Principles of Flavor Retention in Foods. Proc. Inst. Food Tech., 1944. pp. 80-86. - Among other methods for storage and preservation the article mentions that taste-giving substances persist well through all types of storage; stimulants of feeling are relatively stable; the volatile, odor-producing substances are generally sensitive to evaporation, chemical changes including hydrolysis and oxidation, and enzyme action. Since flavor is treated in terms of its components of taste, feeling and odor, for better preservation of the volative flavors in fruits and vegetables that are to be kept for a long period, canning or freezing is recommended instead of ordinary storage.
B. A. 20, 53 (1946).

(544) Crocker, E C., Flavor. New York: McGraw-Hill Company, Inc., 1945. - "In this work, the sensation of flavor is first broken down into its sensory elements, and each of these is discussed in turn. The physical means for stimulating or repressing the respective sensory factors to attain the desired flavor objective are also explained. The chemistry of flavoring agents and condiments and the means for developing and retaining them in processed foods are discussed. Finally methods for the prevention of undesirable off-flavors in commercial products and for the discovery and correction of such as may occur are outlined."
Author's Preface.

(545) Crooks, G.C. and Ritchie, W.S. "Seasonal Variation in Chemical Composition of Common Haddock." Food Research 4, 159-72 (1939). - Water, ash, ether extract, organic N, NH_3, Cu, Fe, Mn and P were determined on 4 series of haddock samples caught over a period of 1 year. These 4 series of samples included fish frozen whole at sea, fish frozen whole by the Birds-Eye method, and commercial fillets frozen by both Birds-Eye and Sharp methods. No significant differences were found in the composition of samples frozen by various methods. C.A. 33, 5533 (1939).

(546) Cruess, W.V., Overholser and Bjarnason. The Storage of Perishable Fruits in Freezing Storage. Calif Ag. Exp Sta Bull. No. 324, 1921.

E M. G.

(547) Cruess, W V. and Overholser, E.L., "Freezing Fresh Fruit in Cans." Canning Age 6, No. 2, 97-99, 129 (1925).

(549) Cruess, W.V. and March, G.L., "Frozen Pack Ripe Olives." Fruit Prod. J. 12, 176 (1933). - Pickled, unsterilized California ripe olives were used. Packing best in brine, no difference in texture noted whether quick or slow frozen. Flavor excellent after a year's storage at 0° to 10°F. Should be used within a day upon thawing. Cost probably greater for frozen olives than for canned ones.

F. F.

(560) Cruess, W.V., Mrak, E.M. and Quin, P.J., "How to Avoid the Browning of Peaches." Canning Age 16, 352-4 (1935); Canner 81, No. 5, 12-13, 28 (1935). - Browning is an oxidation process brought about by oxidases which hasten the combination of atmospheric oxygen with a "color base", possibly a catechol tannin, present in the fruit. By rinsing the washed lye-peeled fruit in 0.5% HCl for 1/2 to 2 minutes, the browning was entirely prevented for 3 hours. Rinsing in 0.5-1% citric acid for 1 to 2 minutes also prevented darkening in most cases for 30 minutes. NaCl or any chloride is also beneficial in preventing browning in cut peaches.

C. A. 30, 8417 (1936).

(561) Cruess, W.V., Commercial Fruit and Vegetable Products, A Textbook for Students, Investigators, and Manufacturers. Second Edition. New York: McGraw-Hill Book Co., Inc. 1938. - 2nd edition of book first published in 1924 has been considerably enlarged. Among other things a new chapter has been added on plant pigments which are concerned with discoloration of canned products. In this, the darkening of frozen-pack fruits is discussed. Enzymes of fruits and vegetables are discussed with reference to changes in the vitamins induced by them during processing, and in odor and flavor by the frozen pack method, and other methods.

F. F.

(562) Cruess, W.V. and West, N., "Report on Frozen Pack Experiments." Fruit Prod Jour. 20, No. 2, 43 (1940). - Some types of ripe olives are unsuited to frozen pack and quick freezing gives a product superior to the slow frozen.

B. A. 17, 1165 (1943).

(563) Cruess, W.V., "Dehydration of Fruits and Vegetables." Canning Age 23, No 11, 574 (1942). - Blanching to the point of a negative guaiacol-peroxide test for peroxidase is essential to secure good keeping quality. Some dehydrators get greatly increased capacity by operating at 180°F. or thereabouts while the product is wet and then finishing at 140° to 150°.

B A. 18, 906 (1944).

(565) Cruess, W V., "A Note on Frozen Pack Fruit Syrup and Concentrates." Fruit Products J. 24, No. 2, 36, 61 (1944). - Fruit syrups made by adding sugar to the fresh juices and fruit concentrates made by vacuum or freezing concentration do not retain their fresh flavor, color, and aroma well at room temperature, but at 0°F. they remain practically unaltered indefinitely; pleasing cold beverages and punches can be made from them.

B. A. 19, 668 (1945).

(566) Cruess, W.V. and Gazewski, A.J., "A Note on Frozen Apple Juice." Fruit Prod. J. and Am. Food Mfgr. 25, No. 1, 5, 27 (1945). - Varieties of apples best suited, methods of extracting juice, storage temperature - freezing storage best, production of sharp cider, thawing frozen juices - necessity for thorough mixing before use, containers, commercial trial and possible markets for apple juice.

F. F.

(567) Cruess, W.V., Glazewski, A.J. and Hohl, L.A. "Freezing Fruit Juices Proved Practical, I and II." Quick Frozen Foods 8, No. 1, 60, 61, 80 (1945). - In general fruit juices preserved by freezing are superior in flavor and aroma to heat-processed juices. Frozen red grape juice concentration to 60°-70° Brix, and lemon and orange juice sweetened to 50° Brix are satisfactory syrups for punches. Juice from Valencia oranges is superior to that from Naval variety for freezing. Apple juice, fresh or fermented to less than 1% alcohol preserves well. Lemon juice has been successfully frozen for nine months. A frozen blend of two parts orange to one part apricot juice stays palatable for one year. In these experiments a storage temperature of 0°F. (-18°C. approximately) was used. The authors believe there are commercial possibilities for properly handled frozen fruit juices.

B. A. 19, 2469 (1945).

(568) Cruess, W.V., Hohl, L.A. and Glazewski, A.J., "Freezing Fruit Juices Proved Practical, III." Quick Frozen Foods 8, No. 2, 58, 111, 113 (1945). - Deterioration in color and flavor of various fruit juices when pasteurized and stored at ordinary temperatures is avoided by freezing at 0°F. Experiments cover juices from varieties of plum, prune and tomato. The latter is improved by addition of 5% lemon juice and 0.5% sodium chloride. Blending of juices, e.g., 2 parts prune and one part grape juice, is believed to open commercial possibilities. A desirable frozen punch syrup is made by blending two volumes concord grape juice, 2 lemon, one volume orange, and one grapefruit, plus sugar to bring to 50° Brix. This is diluted with four volumes of water before use.

B. A. 20, 183 (1946).

(569) Cruess, W.V., "Refrigeration - A Phase of Food Technology." Refrig. Eng. 50, No. 4, 326-8 (1945). - Paper presented at American Society of Refrigerating Engineers meeting for 1945. Author discusses importance of the condition of foods before storage: variety selections, care given during picking, handling, holding, and packing, promptness with which foods are refrigerated, all affect final product. Author gives a brief resume of the research on frozen pack fruits and vegetables at the University of California from 1918 to date.

F. F.

(570) Culpepper, Caldwell, and Wright. Preservation of Peaches for Use in the Manufacture of Ice Cream. U. S. Department of Agriculture, Technical Bulletin No. 84, 1928.

(571) Cultrera, R., "Methods of Preservation and Their Influence Upon Nutritive Value of Vegetables." Nuovi Agric. 18, No. 2, 103-108 (1938). - Review of objectives and methods of food preservation. Chemical methods include among other things, solids which retard fermentation only in high concentrations, and liquids with preservative action. Drying, although it results in loss of aroma, of small amount of vitamin C, and of sugars, does not greatly modify the nutritive value of fruits and vegetables. Specific influence of sterilization with steam or hot water on vitamins is given for tomato, cabbage, spinach, peas, beans, peaches, pears, and honey. The stability of vitamin C is shown to be governed to a considerable extent by the pH of the medium.

B. A. 12, 1404 (1938).

(572) Cummings, F.D., "Progress in Packing Meat Products." Food Indust. 10, No. 3, 126-8, 188-90 (1938). - Article discusses new and old methods of determining package standards; various materials used for wrapping and packaging of packing house products which are familiar to operating men in meat industry; importance of selecting right shipping containers; means of cutting cost of containers. Before Institute of American Meat Packers.

E. I. 1938, 860.

(573) Cursiefen, W., "Facts About Cooling and Freezing Fish." Zeit Fuer Die Gesamte Kaelte-Industrie 47, No. 3, 43-8 (1940). - Aspects governing cooling and freezing of fish discussed, and charts presented showing influence of various factors.

E. I. 1940, 1022.

(574) Cutting, C.L., "Thawing of Frozen Fish." Modern Refrig. 43, No. 511, 198-9 (1940). - Fish thawing problems and method of overcoming them discussed; article is sequel to paper by G. A. Reay indexed from July 1940 issue.

E. I. 1940, 1022.

(575) Dana, H.J. and Miller, R.N. Building the Farm Freezing Plant. State College of Washington Engineering Extension Bulletin No. 64, 1940. 32 pages.

(576) Daniel, E.P. and Munsell, H.E. Vitamin Content of Foods. United States Department of Agriculture, Miscellaneous Publication No. 275, 1937.

(577) Davis, E. and Tolman, E. Preservation of Farm Products by Freezing. State College of Washington Engineering Extension Bulletin No. 230, 1942. 19 pages.

(578) Dawson, R.S. "Selection and Application of Thermostatic Expansion Valves for Low Temperature Installations." Refrig. Eng. 44, No. 4, 222-4 (1942). - Consideration of factors involved in low temperature installations which effect change in thermostatic expansion valve performance and capacity; methods of securing sufficient valve capacity; and general information pertaining to thermostatic expansion valves.
W.B.C.

(579) Day. Frozen Foods and Lockers. United States Department of Commerce, Inquiry Reference Service, 1945.

(580) De Felice, D. and Fellers, C.R. "Carotene Content of Fresh, Frozen, Canned, and Dehydrated Spinach." Proc. Amer. Soc. Hort. Sci. 35, 728-33 (1938). - Detailed directions are given for the determination of carotene in spinach and other fruits and vegetables by a modified Russell, Taylor, and Chichester method. The chemical method for carotene gave slightly lower, but closely similar values for fresh andprocessed spinach than the rat bioassay. The mean ratio of vitamin A potency, as determined by rat assay, to carotene content was 1.7. Using this value, fresh, frozen, canned, and dehydrated spinach contain respectively, 718, 545, 475, and 495 I.U. per gram. Storage of canned or frozen spinach for 73 days had no effect on its vitamin A content. For comparative work on fresh and processed plant tissues, carotene values should be reported on the basis of water-free tissues.
B.A. 12, 783 (1938)

(581) De Felice, D. "Effect of Processing on Carotenoid (Provitamin A) Content of Peaches." Food Research 7, 16-25 (1942). - A chemical method of determining the vitamin A content of a peach sample containing carotenoids of varying vitamin A potency was developed by combining a B carotene determination and a Tswett adsorption-column technique. Frozen sliced peaches and frozen peach pulp were shown to contain approximately 75% of the vitamin A potentially available in the whole fresh peach. Pressing of peaches for juice resulted in lossess of approximately 50% of the carotenoids possessing vitamin A activity, while centrifuging of these peach juices resulted in additional losses of Vitamin A precursors up to 30%. C.A. 37, 1792 (1943)

(582) De Felice, D. "Freezing Foods." Ind. Eng. Chem. 35, 26-8 (1943).

(584) Delf, E.M. "Influence of Storage on the Antiscurvy Value of Fruits and Vegetable Juices." Biochem. J. 19, 141-52 (1925). - Experimental data and results of tests on the retention of vitamin C during storage: cold storage, frozen storage, canning. Canned orange juice appeared most stable with the frozen juices of orange and lemon coming next in the order of stability. In whole fruits it appeared that so long as there was living tissue, the vitamin C was preserved.

F.F.

(585) De Mariano, E. "Twelve Months with Frozen Foods." Quick Frozen Foods 8, 7198 (1945). - Experiments on quick freezing cooked foods at TWA kitchen at Kansas City, Mo.

B.J.W.

(586) Denny, F.E. "Inactivation of the Browning System in Frozen Stored Fruit Tissue." Contr. Boyce Thompson Inst. 12, No. 4, 309-320 (1942). - Tissue of the fruits of peaches, pears, and apples, after having been peeled, cored, or pitted, was dipped in dilute solutions of thiourea, NH_2CSNH_2 (also called thiocarbamide), previous to freezing in a cold room at -6° to -10° C. The tissue so frozen was stored for many months or even for more than a year without the occurrence of browning. A dipping solution of 0.1% thiourea sufficed for peaches and pears and one of 0.2% for apples. Fruit tissue so dipped and frozen did not turn brown when thawed and exposed to air, nor after it had been thoroughly leached with water during a period of 20-24 hours (to remove the absorbed thiourea). The treatment had rendered the tissue incapable of turning brown on exposure to air. Only brief storage of the treated tissue in the frozen condition was needed to inactivate the browning system. For peach tissue dipped into 0.1% solution thiourea, the time required for inactivation was 1-2 days, for pear tissue 2-4 days, and for apple tissue dipped into 0.2% thiourea it was about ten days.

B.A. 16, 1450 (1942).

(587) Dernovaskaya-Felentsova, G.L. and Dylevskaya, V.G. "Stability of Vitamin C in Stored Berries and Mandarin Oranges." Proc. Sci. Inst. Vitamin Research U.S.S.R. 3, No. 1, 284-8 (1941). - Strawberries, raspberries, cherries, and black currants were frozen at -8°C. with and without sugar. Vitamin C retention was 78-86% in strawberries and 80-97% in the others when frozen in syrup. Thawing losses were small (-6%) in black currants and cherries, but varied widely (5-45%) in strawberries when frozen with sugar. Without sugar the loss on thawing was still only 5% in black currents, but it was 20% in cherries and 40-50% in strawberries. In these tests, thawing was affected slowly (24 hours). Mandarin oranges, wrapped in paper and packed in crates, retained up to 95% of the initial vitamin C content in three months storage.

C.A. 36, 2943 (1942).

(588) Diehl, H.C. Some Results of an Investigation of the Barreling and Freezing of Berries in the Pacific Northwest. Washington State Horticulture Association, Proceedings 21st Annual Meeting, 1926. pp. 164-70.

(589) Diehl, H.C. Barreling and Freezing of Berries. Oregon State Horticultural Society Annual Report No. 19, 1927. pp. 28-35.

(590) Diehl, H.C. Barreling and Freezing of Small Fruits. Washington State Horticulture Association Proceedings 23rd Annual Meeting, 1928. pp. 192-7.

(591) Diehl, H.C. "The Cold-Pack Method of Preserving Berries in the Northwest." Glass Packer 2, 115-29 (1929). - The use of sucrose in the ratio of 2 parts of fruits to 1 of sucrose in the cold pack method of preservation retards yeast and mold developments, reduces the danger of fermentation, preserves the color of the fruit and to some extent maintains the characteristic flavor and aroma of the berries. Temperatures of -15° to -9° are used for freezing the berries, but storage at the latter temperature is satisfactory. Even at -17°, a 50 gallon barrel of fruit and sugar (2:1) reached a temperature of 5° only after 36-48 hours. The freezing point of a 2:1 pack of berries and sugar is from -3° to -4°. Numerous tests proved that the chemical characteristics of berries, which are of importance in the manufacture of jams, jellies and juices, were not significantly affected by the storage of fruit in the frozen state.

C.A. 23, 2508 (1929).

(592) Diehl, H.C. and Hawkins, L.A. "Frozen Pack Method of Storing Berries." Ice and Refrig. 76, No. 6, 497-8 (1929); Refrig. World 64, 7-10 (1929). - Study of preservation of berries by freezing them in barrels, kegs, or cans; effect of various temperatures with rise of sugar. Paper presented at Am. Inst. Refrig.

E.I. 1929, 1574.

(593) Diehl, H.C. and Hawkins, L.A. "Frozen Pack Method of Storing Berries." Refrig. 45, No. 6, 54-5 (1929). - Preserving of berries by freezing them in barrels, kegs, or cans, commonly called frozen-pack or cold pack method, has grown to be industry of considerable importance in U.S. Various types of rocking platforms are in use, some of them mechanically operated; importance of quick cooling until fruit reaches temperature of 40° F. or below cannot be too strongly emphasized.

E.I. 1929, 478.

(594) Diehl, H.C. Frozen Pack of Fruits and Vegetables in Retail Packages. Washington State Horticulture Association, Proceedings 25th Annual Meeting, 1930. pp. 213-17.

595) Diehl, H.C., Magness, J.R., Cross, C.R. and Bonney, V.B. Frozen-Pack Method of Preserving Berries in the Pacific Northwest. U.S. Dept. of Agric., Tech. Bull. No. 148, 1930. 38 pages.

596) Diehl, H.C. "Freezing of Fruits and Vegetables Requires More Research." Food Industries 2, No. 4, 162-4 (1930). - Group action desirable; maturity of raw material; type of containers, rapidity of cooling and freezing; importance of microbiological research; development of hand-

ling facilities; accepted temperature about 0° F.; slight motion aids in freezing; economic justification necessary.

E.I. 1930, 1502.

(597) Diehl, H.C., Magness, J.R., Cross, C.R. and Bonney, V.B. "The Frozen-Pack Method of Preserving Berries." Ice and Refrig. 78, No. 3, 255-256 (1930). - Review of Technical Bulletin No. 148, issued by the United States Department of Agriculture; investigation carried on in Pacific Northwest to examine different phases of barreling and freezing berries, and to determine best practical procedure for handling fruit by frozen-pack method.

E.I. 1930, 411.

(598) Diehl, H.C. "The Refrigeration of Fruits and Vegetables." Ice and Refrig. 79, No. 1, 55-58 (1930). - Conservation of fruits and vegetables by low temperatures and preservation by freezing temperatures; objectives of refrigeration; before Pacific States Cold Storage Warehousemen's Assn. Cf. Glass Container 9, No. 4, pp. 8-9, 16 and No. 5, pp. 8-9, 32: "Preserving Fruits and Vegetables by Freezing."

E.I. 1930, 1500.

(599) Diehl, H.C. "A Physiological View of Freezing Preservation." Ind. Eng. Chem. 24, 661-5 (1932). - Strawberries, raspberries, cranberries, and peaches have a better eating quality if not frozen too rapidly. An excessive formation of ice crystals is to be avoided. Fruits and vegetables have a varietal and a maturity variation relative to optimum freezing preservation requirements. Factors such as the use of fruit syrups, the prevention of oxidation, the adjustment of pH and the uniformity of heat transfer at moderate freezing temperatures are of importance.

C.A. 26, 3854 (1932)

(600) Diehl, H.C. and Berry, J.A. "The Temperature Factor in the Freezing Preservation of Fruits and Vegetables." Proc. Am. Soc. Hort. Sci. 29, 287-90 (1933). - These studies consider the behavior of fruits and vegetables exposed to -100 to +32° F. Temperatures near 0° F. were best for preservation of these products. Storage at 20° to 25° F. was unsuitable.

B.A. 8, 2273 (1934)

(601) Diehl, H.C. "Some Factors in the Freezing Preservation of Fruits and Vegetables." Wash. State Hort. Assoc. Proc. 28th Annual Meeting, 1932. pp. 303-5. - Cf. C.A. 26, 3854. The preservative effect of CO_2 produced by respiration under suitable circumstances is considered.

C.A. 28, 4500 (1934)

(602) Diehl, H.C. and Berry, J.A. "Relation of Scalding Practice and Storage Temperature to Quality Retention in Frozen Pack Peas." Proc. Am. Soc. Hort. Sci. 30, 496-500 (1933). - "The experiments here reported emphasize the importance of adequate scalding and rapid cooling immediately thereafter for peas preserved by freezing, and indicate that temperatures about 0 degrees F. are satisfactory for the commercial preservation of this vegetable. Similar experiments with some other vegetables not here reported in detail, indicate essentially the same facts

for these also."

Authors' Conclusions

(603) Diehl, H.C., Dingle, J.H., and Berry, J.A. "Enzymes Can Cause Off-Flavors Even When Foods are Frozen." Food Ind. 5, 300-1 (1933). - Alderman peas, asparagus, spinach, lima beans, and snap beans after storage at freezing temperatures for 4-6 weeks acquire undesirable flavors and odors which are accentuated by cooking. In general, a scalding process sufficient to destroy catalase prevented the enzymic deterioration of frozen peas. Minimum scalding periods were 30 sec. at 100°, 50 sec. at 88° or 105 sec. at 71°. Rapid cooling of the vegetables after scalding is recommended as an aid to preserving quality. Catalase serves as a useful index to the destruction by heat of other enzymes in fresh vegetables.

C.A. 28, 218 (1934).

(604) Diehl, H.C. "Progress Report United States Frozen Pack Laboratory, Seattle, Washington." Ice and Refrig. 84, No. 3, 206-8 (1933). - Paper presented at Annual Convention of Fruit Barrelers' Assn.; results of experimental work; reaction of product to freezing preservation; storage temperatures; preparation and preservation of frozen pack products; treatment prior to freezing; preservation at moderately low temperatures; accessory factors in freezing preservation; frozen fruit pulp; agitation of barrels of fruit during freezing; frozen pack transportation test.

F.F.

(605) Diehl, H.C. "Preservation by Freezing of Fruits and Vegetables." Ice and Refrig. 85, No. 1, 29-30 (1933). - Frozen pack industry in Pacific Northwest; value of technical research; summary of results obtained by frozen-pack laboratory at Seattle, Washington; before Pac. N.W. Advisory Board.

E.I. 1933, 959.

(606) Diehl, H.C. "A Chamber for Experimentally Freezing Horticultural Products at Very Low Temperatures." Science 78, 15-16 (1933). - Description of freezing chamber for experimental freezing of small amounts of product at temperatures ranging from 32°F. to -100°F. Solid carbon dioxide and denatured alcohol used as cooling medium; chamber constructed of wood, sheet iron, sheet copper, and cork insulation.

W.B.C.

(607) Diehl, H.C. "Use of Low Temperatures for Freezing Preservation of Fruits and Vegetables." Ice and Refrig. 86, No. 6, 1-3 (1934). - Practical usefulness of moderate low temperatures now established; accessory factors in preservation; agitation of frozen pack fruits; before Pac. States Cold Storage Warehousemen's Assn.

E.I. 1934, 931.

(608) Diehl, H.C., Pentzer, W.T., Berry, J.A. and Asbury, C.E. "Suggestions for Freezing Foods Outlined." Western Canner and Packer 26, No. 5, 31-3; No. 6, 39-41; No. 7, 33-5; No. 8, 43-4 (1934).

(609) Diehl, H.C. and Berry, J.A. "Freezing Tests with Golden Bantom Corn

on the Cob." Ice and Refrig. 89, No. 1, 35-36; No. 2, 89-90; No. 3, 131-2 (1935); Western Canner and Packer 26, No. 12, 13-15, 27 (1934); 27, No. 1, 28, 30, 32 (1935). - Discussion of experiments on selection and preparation of sweet corn on cob for frozen preservation conducted by Bureau of Plant Industry, United States Department of Agriculture; comparative packs of frozen and canned corn, selected according to maturity; use of flowing steam.

E.I. 1935, 913.

(610) Diehl, H.C., Campbell, H., and Berry, J.A. "Freezing of Alderman Peas." Food Research 1, 61-71 (1936). - An exposure of shelled peas to a steam or water temperature of 93.3-98.9° for one minute insures stablilty in quality of peas frozen at -18°; it does not completely destroy such enzymes as catalase and peroxidase. Insufficient blanching (scalding) causes the development of off-flavored frozen peas. Freezing storage of scalded peas packed without liquid either at -20.6° or at -6.7° for one year had no significant effect on the dry matter: starch, total sugar, hydrolyzable polysaccharides and ether extraction. Freezing storage of scalded peas packed in 2% NaCl brine at the above temperatures lost approximately 15% dry matter and 40% sugar. Raw shelled peas may harbor a million bacteria per gm. Marked multiplication may occur in 6 hours at 21.1°. The initial scalding process destroys approximately 99% of the bacteria present, but unless the peas are very promptly frozen, the remaining 1% poliferate very rapidly and cause deterioration in the vegetable. The lower temperature limit for bacterial growth is approximately -9.4° to -6.7°.

C.A. 30, 2656 (1936)

(611) Diehl, H.C. "The Progress of Frozen Foods." Ice and Refrig. 90, 287-8 (1936). - Storage for almost a year at -5°F. and at 20°F. of suitable scalded peas packed without liquid has practically no effect on the ether extraction and carbohydrate content of the peas. Similar storage of scalded peas in 2% NaCl solution resulted in considerable losses of dry matter and soluble carbohydrates into the liquid surrounding the peas. No marked changes in the above mentioned constituents resulted from the scalding and rapid cooling of peas by live steam or by hot water. Scalding at 212° F. for 30 seconds is preferred over scalding at lower temperatures for suitably extended periods of time. Peas may be held without deterioration for short periods after harvest before subjecting to the cold-pack procedure. The color changes undergone by peas at 20°F. in normal atmosphere in sealed containers are accelerated when CO_2 gas is present in considerable amounts. Bacteriological and technological aspects of the problem are also discussed.

C.A. 30, 8407 (1936)

(612) Diehl, H.C. "Progress Reports on Frozen Pack." Ice and Refrig. 90, 429-30 (1936). - The scalding of peas as practical for frozen-pack material, results in no marked changes in their chemical constituents, other than a slight loss of soluble materials (mainly sugar) when the scalding is done in hot water which do not obtain when the scalding is done with live steam. The most satisfactory frozen-pack peas are obtained by scalding at 210°F. for 30 to 60 seconds. Scalding at a lower temperature even for longer times gave peas an inferior color and flavor due possibly to the activity of incompletely activated plant enzymes. Storage of properly prepared garden peas at about 0° F. produced no significant chemical changes within a year's storage period except with those frozen in 2% NaCl Solution in which case considerable

amounts of solids were leached out by the brine.
C.A. 30, 8407 (1936)

(613) Diehl, H.C. and Birdseye, M. Storage of Fruits and Vegetables in Community Freezer Lockers. United States Department of Agriculture, Miscellaneous Extension Publication 47, 1938.

(614) Diehl, H.C. "Vegetable Variety Studies in Relation to Freezing." Canning Age. 19, 273-4 (1938).

(615) Diehl, H.C. "Storage of Frozen Foods at 0° F." Refrig. Eng. 36, 232 (1938). - Digest of speech at meeting of State Lockermen's Assn., Corvallis, Oregon, 1938. 0° F. is temperature best suited for locker storage of frozen foods; it is obtainable with reasonable economy and can be maintained with little fluctuation. It should be generally adopted so that there is uniformity in the locker industry. The responsibilities of operators of locker plants are discussed.
F.F.

(616) Diehl, H.C., Wiegand, E.H., and Berry, J.A. Preservation of Fruits and Vegetables by Freezing in Pacific Northwest. U.S. Department of Agriculture, Mimeographed Circular 53, 1939.

(617) Diehl, H.C., Campbell, H., Joslyn, M.A. and Marsh, G.L. "Two Major Laboratories Issue Joint Statement on Blanching." Western Canner and Packer 31, No. 4, 117 (1939).

(618) Diehl, H.C. "Quick Freezing Fruits." Section in Refrigerating Data Book. Fifth Edition. New York: Am. Soc. of Refrig. Eng., 1940. Volume II, pp. 19-24. - Discussion of preservation of fruits by freezing giving methods, varietal selection, distribution of frozen products, microbiology of frozen fruits and vegetables, storage temperatures. Bibliography.
F.F.

(619) Diehl, H.C. "Quick Freezing Vegetables." Section in Refrigerating Data Book. Fifth Edition. New York: Am. Soc. of Refrig. Eng., 1940. Volume II, pp. 25-30. - Discussion of commercial freezing methods, effects of quick freezing on tissues, varietal studies, harvesting and processing, packaging, blanching, storage, transportation and distribution.
F.F.

(620) Diehl, H.C. "Freezing Preservation and Frozen Pack Research." Ice and Refrig. 98, No. 6, 495-7 (1940). - Resume of investigation of Bureau of Agricultural Chemistry and Engineering, United States Department of Agriculture; before Pac. States Cold Storage Warehousemen's Assn.
E.I. 1940, 1022.

(621) Diehl, H.C. and Berry, J.A. Freezing and Storage of Frozen Pack Fruits and Vegetables. Association of Refrigeration Warehouses Special

Bulletin 2 (12), 1941, pp. 1-7.

(622) Diehl, H.C. "Technological Aspects of Locker Plant Industries." Quick Frozen Foods 3, No. 7, 16-17, 42 (1941); No. 8, 24, 37-8 (1941).

(623) Diehl, H.C. "Can Frozen Foods Help Win the War and Write the Peace?" Ice and Refrig. 102, No. 3, 178-81 (1942).

(624) Diehl, H.C. and Rabak, W. "Packaging Frozen Foods Under War Conditions." Proc. Inst. Food Technologists 1942, 117-120 (1942); Food Industries 15, 120-1 (1943). - Damaging moisture losses from frozen foods during storage are due to inefficiency of packaging materials or of sealing, movement of air during storage, and low humidities of storage atmosphere. To obtain a continuous protective film over frozen products, "glazing" with ice is not satisfactory for long periods because of volatization. Glazing with moisture-vapor-proof thermoplastics is shown to be entirely feasible; the frozen material is dipped into thermoplastic mixtures; oxidation and loss of moisture and flavors are inhibited.

B.A. 17, 1649 (1943).

(625) Diehl, H.C. "Let's Take a Look at Frozen Foods." Refrig. Eng. 48, No. 5, 365-81, 389, 440 (1944). - Over-all survey of future of frozen foods industry; factors contributing to phenomenal growth of industry to date; importance of quality maintenance emphasized. Before Am. Soc. Refrig. Engrs.

E.I. 1944, 889.

(626) Diehl, H.C. and Warner, K.F. Freezing to Preserve Home-Grown Foods. U.S. Dept. Agr. Circ. 709, 1945. 62 pages. - Changes in frozen food are caused by (1) bacteria molds and yeasts; (2) the chemical action of enzymes, or ferments; (3) ice formation on freezing; (4) surface drying or "freezer burn"; and (5) unfavorable storage conditions or too long a storage period. Improved methods that will insure a minimum of changes in the frozen products during storage are described for freezing supplies of fruits, vegetables, meats, poultry products, and sea foods.

C.A. 39, 5343 (1945).

(627) Diehl, H.C. and Havighorst, C.R. "Frozen Foods." Food Indus. 17, No. 3, 261-78 (1945). - Past, present, and future pictures of frozen food industry are analyzed by products and problems.

B.A. 19, 1363 (1945).

(628) Diehl, H.C. "Refrigeration Research Foundation Reports on Microbial Spoilage of Frozen Foods." Ice and Refrig. 108, No. 5, 49-50 (1945). - Micro-organisms in frozen foods cannot multiply in numbers to cause spoilage at 15° F. or below. If, however, spoilage has begun (because of high initial populations, delay in getting product frozen, very slow and incomplete freezing, or defrosting--if only temporary), then it may continue at temperatures too low for the bacteria to multiply. To cut down on spoilage, the following suggestions are made: (1) plant personnel trained to recognize and weed out partially

frozen packs and report such conditions to proper persons, (2) temperature readings on center of occasional cases such serve as control, (3) any unusual appearance of cases should be noted and checked, (4) proper storage for air movement where any doubt exists as to how thoroughly foods have been frozen.

E.F.

(629) Doremus, R.C. "Special Refrigeration Applications--Some Important Developments." Ice and Refrig. 103, No. 2, 80-4 (1942). - Applications mentioned include: air conditioning of armored bank cars; ventilation of fermenting cellars in breweries; various uses of finned pipe line in refrigeration processes; portable freezer units.

E.I. 1942, 921.

(630) Dowell, A.A., Warrington, S.T., Eggert, R.J. and Fenske, L.J. Cold Storage Locker Plants: Economics. University of Minnesota Ag. Experiment Station Bulletin No. 345, 1940. 39 pages. - Analysis of investment; operating costs; income; meat handled.

E. B.

(631) Du Bois, C.W. and Tressler, D.K. "Moisture-Vapor Proofness of Wrapping Materials Used on Frozen Foods." Paper Trade J. 109, No. 20, 15-18 (1939); Ice and Refrig. 97, 449-51 (1939); Food Ind. 12, No. 3, 96.- On the assumption that a paper or other wrapping material adequately protects meat and other foods from desiccation, if, at 5° F. it transmits not more than 3 grams of moisture vapor per square inch per 24 hours and if in addition the material is not stained by blood or by grease and does not become brittle at low temperatures or impart a flavor to the food, 13 of 25 materials tested were considered satisfactory for use in packaging foods for storage in refrigeration lockers.

C.A. 34, 2601 (1940).

(632) Du Bois, C.W., Tressler, D.K. and Fenton, F. "Influence of Rate of Freezing and Temperature of Storage on Quality of Frozen Meat." Proc. First Food Conf. Inst. Food Technologists I, 167-179 (1940). - Time (in hours) required to cool a 3 pound 12 ounce beef roast down to 10° F. in still air at 0° F. 20; still air at -10° 16; before a fan at 0° 9; before a fan at 0° 8.5; brine immersion at -10° 5.5; brine immersion at -25° 4; brine spray at -10° 2.5; birdseye froster 2. The cellular structure of the slow frozen meat was more disrupted than that of the rapidly frozen samples. Quick frozen roasts were somewhat more palatable than the slow frozen ones. However, even the meat frozen at slowest rate was very good, and not dry and tasteless as has sometimes been reported. The lower the temperature of storage, the longer the meat can be kept before showing signs of rancidity. At +15° F. pork showed signs of rancidity at 2 months; at 10° F. a slight rancidity was noted in 3 months and a marked rancidity in 4 months. Pork kept at 0° F. was still in good condition after 12 months' storage. Beef and lamb do not become rancid as quickly as does pork. These meats, however, kept much better at the lower temperatures studied. This work indicates the importance of maintaining all meat which is stored for longer than a few months at 0° F. or lower.

B.A. 15, 1737 (1941).

(633) Du Bois, C.W. and Tressler, D.K. "The Preparation and Freezing of Certain Vegetables in Lockers." Refrig. Eng. 39, 107-8 (1940). - The preparation of the following vegetables for freezing storage was studied: beets, beet greens, Swiss Charde, kale, curly mustard, kohlrabi, carrots and green shell beans. In determining scalding periods the length of the treatment required to inactivate catalase and peroxidase in the respective vegetables was first determined. In determining peroxidase, a sample of the vegetable under consideration was pressed in a mortar to extract the juice. Five cubic centimeters of juice was mixed with 5 cubic centimeters of water and to this was added one cubic centimeter of a 1% guaiaeol solution and a 1% H_2O_2 solution. A brown coloration developing in 30 minutes indicated the presence of peroxidase.

C.A. 35, 5585 (1941).

(634) Du Bois, C.W. and Lee, F.A. An Attempt to Judge the Tenderness of Vegetables by Means of the Tenderometer. Proc. 2nd Food Conf. - Inst. Food Tech. II, 1941. pp. 37-41.

(635) Du Bois, C.W., Tressler, D.K., and Fenton, F. "Effect of Rate of Freezing and Temperature of Storage on Quality of Frozen Poultry." Refrig. Eng. 44, No. 2, 93-9 (1942). - Results of investigation. Bibliography.

E.I. 1942, 923.

(636) Du Bois, C.W. "Farm Freezer Analysis." Agric. Eng. 24, No. 10, 343-4, 346 (1943). - A survey covering experiences of 20 farmer owners of freezing cabinets in New York State in 1942.

B.A. 18, (1944).

(637) Du Bois, C.W. and Tressler, D.K. Seasonings, Their Effect on Maintenance of Quality in Storage of Frozen Ground Pork and Beef. Proc. Inst. Food Tech., 1943. pp. 202-7. - The effects of pepper, sage, mace, ginger, salt and salt impurities and of holding samples for varying periods at 32° F. prior to freezing on development of rancidity in beef and pork during storage at 0° F. and 10° F. were investigated. NaCl produced rancidity in both the beef and the pork. Pepper, sage, mace, and ginger seemed to have an anti-oxidant effect on the fat during storage. The longer ground pork was held after slaughter before freezing the more quickly it oxidized in frozen storage.

C.A. 38, 6410 (1944).

(638) Du Bois, C.W. and Tressler, D.K. "Freezing Plates for Locker Plant Freezing and Farm Freezer Storage Compartments." Refrig. Eng. 46, No. 1, 25-30, 68 (1943). - Diagrams and discussion of method, rates of freezing, air circulation and its part--illustrated with charts and graphs.

F.F.

(639) Du Bois, C.W. and Colvin, D.L. "Loss of Added Vitamin C in the Storage of Frozen Peaches." Fruit Prod. J. and Am. Food Mfgr. 25, No. 4, 101-3 (1945). - Studies on loss of added vitamin C during freezing storage showed 32% loss if storage temperature was constant, and 50% loss if temperature fluctuated between 5° F. and -5° F. Steam peeling

has some advantage over lye peeling for retention of vitamin C. If lye peeling is used, citric acid dip aids in cutting down on loss of vitamin C. Vitamin C is added to peaches to inhibit browning during storage. Its effectiveness is lost if all the lye is not removed.

F.F.

(640) Dugdale, C.M. "The Chemical and Biochemical Changes in Food Stored in Relation to the Nutritive Value of the Food." J. State Med. 32, 564-73 (1924). - A discussion of the effect of freezing, chilling, and canning on the protein and vitamins of meat and vegetables. Conclusion: the human consumption of an increased proportion of such foods should be without ill effects.

C.A. 19, 2538 (1925).

(641) Dunker, C.F., Fellers, C.R., and Fitzgerald, G.A. "Stability of Vitamin C in Sweet Corn to Shipping, Freezing, and Canning." Food Research 2, 41-50 (1937). - Raw, fresh cooked (cut or cob), frozen and whole grain canned sweet corn are all moderately good sources of Vitamin C and contain 40-60 international units per ounce, e.g., .07-.12 milligrams of ascorbic acid per gram. Canned cream-style sweet corn is somewhat lower in vitamin C than whole grain. Little loss in ascorbic acid occurs in sweet corn after picking if stored in the husk. Similarly, frozen sweet corn can be defrosted with very little loss of its vitamin C content. The indophenol titration results checked the guinea-pig bioassay results except when large quantities of corn were fed the animals. Some loss in ascorbic acid occurred before the corn was consumed and the bioassay method gave somewhat lower results.

C.A. 31, 5052 (1937).

(642) Dunker, C.F. and Fellers, C.R. "Vitamin C Content of Spinach." Proc. Am. Soc. Hort. Sci. 1938 36, 500-4 (1939). - Fresh raw spinach contains 400-450 international units of vitamin C per ounce. The loss on cooking amounts to 33-67%, depending on the quantity of water used; from 10-30% of the original vitamin C content can be recovered from the cooking water. Canning causes a loss of 60-65% of the vitamin content, freezing, a loss of 45%, and dehydration results in a loss of all the vitamin C. No dehydroascorbic acid was found in either canned or frozen spinach. Satisfactory checks were obtained on the fresh raw and fresh cooked spinach by the dye titration and the animal bioassay methods. With canned spinach the dye-titration method gave somewhat higher results.

C.A. 33, 8845 (1939).

(643) Eaves, C. A. Gas and Cold Storage as Related to Fruit Under Annapolis Valley Conditions. 71st Ann. Rept. Nova Scotia Fruit Growers Assoc., 1934. pp. 92-8. - Cf. C. A. 29, 6320; 30, 131. McIntosh apples were stored in carbon dioxide concentrations of 5 - 10%, both at 38° F. and in common storage for over two months without undergoing any deterioration in flavor, color or firmness; fruit stored under the same conditions in ordinary atmosphere underwent undesirable changes. At lower temperatures (32-35° F.) and at higher concentrations of carbon dioxide (20%) the fruit tended to break down. Apples stored in 20% carbon dioxide developed a distinctly alcoholic flavor and scalded in a very short time.

C. A. 30, 2655 (1936).

(644) Echneekenberg, E., "Rapid Freezing of Meat in Brine Without Salt Penetration." Refrig. Eng. 20, 177-8 (1930). - A reprint of article appearing in Ice and Cold Storage, June 1930, pg 152. Deals with the discoloration of meat during freezing. Oestert, of the Technical High School Danzig, in 1925 experimental with protective coatings, additions to brine, post treatment with hot water, and combinations of all three. Results of tests show that meat frozen in a solution consisting of 1 liter of water, 157 grams of salt, 0.45 grams of hydrate of lime, and 2% of ammonia was fully equal to fresh meat both in appearance and taste. Investigation was done using small pieces of meat and changes would probably have to be made in the solution when freezing whole quarters of beef.

W. B. C.

(645) Eckart, T. G. and Cruess, W. V., "Freezing and Storage of Pineapple Products." Fruit Prod. J. & Am. Vinegar Indust. 10, No. 12, 364-6 (1931). - Pineapples and pineapple juice did not darken during preparation, freezing, freezing storage, and thawing giving this fruit a great advantage in suitability for freezing storage over peaches, pears, apricots and certain other fruits. Crushed pineapple, sliced pineapple, pineapple juice and other juices retained their flavor perfectly in freezing storage, when sealed against entrance of cold storage flavors and odors and against loss of flavor. The digestive ferment bromelin contained in pine-apple juice was not noticeably affected by freezing storage. The "frozen-pack" products were preferred by all persons who compared them with heated products.

B. A. 8, 1762 (1934).

(646) Edmunds, C. E. Federal Inspection of Dressed Poultry for Condition and Wholesomeness. Proceedings of 7th World Poultry Congress, 1939. pp 403-6.

(647) Eggert, R. J., "How Cold Storage Lockers May Affect Livestock Distribution." Ice & Refrig. 95, No. 2, 135-7 (1938).

(648) Eickelbary, E. W., "Effect of the Rate of Freezing on the Texture of Peas." Canning Age 19, 498-9 & 512 (1938). - Quick-frozen peas have fewer ruptured cells and are superior in color and flavor to slow-frozen peas at higher temperatures. There is a more marked reduction in the numbers of

microorganisms in the quick-frozen product. Enzyme activity is likewise reduced materially at the lower temperatures.

C. A. 34, 187 (1940).

(649) Eickelberg, E. W., "Quality Control in Quick Frozen Foods." Quick Frozen Foods 5, No. 7, 12-3 & 52 (1943). - Quality control in vegetable industry depends upon selection of produce (variety and maturity are important factors); proper handling to insure best results - avoiding damage to vegetables, before blanching be sure to handle so as to climinate chemical and bacteriological changes; proper blanching at proper time (for example) it is best to blanch peas before grading them as shelled peas are especially susceptible to chemical and bacteriological changes, and blanching reduces these changes; separation for quality and size; sanitary control; testing for proper blanching; cold storage and freezing methods; careful inspection along the production line.

F. F.

(650) Ellis, N. R. and Howe, P. E., "Changes in the Fat of Meats During Freezing and Storage." Ice & Refrig 100, 459-60 (1941). - Paper presented at Annual Meeting American Institute of Refrigeration, Washington, D. C. 1941. Summary of knowledge on unfavorable changes occuring in fats of meats during storage and freezing - primarily dependent upon biochemical activity of enzymes and microorganisms; chemical composition of fat; source and kind of meat.

F. F.

(651) Elvehjem, C. A., "Vitamins and Food Processing." Agric. Eng. 26, No. 1, 12, 15 (1945). - Brief survey indicating the need for more research on the nutritional quality of foods as related to processing. As new techniques are developed, it is important to study the vitamin retention, as well as the consumer appeal of the final products.

B. A. 19, 1111 (1945).

(652) Emmett, A. D. and Grindley, H. S., "A Preliminary Study of the Effect of Cold Storage Upon Beef and Poultry." Ind. Eng. Chem. 1, 413-36, 580-97 (1909). - Early history of cold storage of meats and poultry - freezing storage mentioned. Experiments given are for storage at 33-35° F.

F. F.

(653) Empey, W. A., "Studies on Refrigeration of Meat." Soc. Chem. Indust. J. (Trans. & Communications) 52, No. 30, 230T-6T (1933). - Conditions determining amount of drip from frozen and thawed muscle.

E. I. 1933, 960.

(654) Erdman, F. S., "Frozen Food Locker Plants - An Engineer's Viewpoint." Refrig. Eng. 47, No. 3, 192-4, 232, 234, 246 (1944). - Discussion giving review of the subject of the planning of locker plants and touching on the economics of the industry. Covers such topics as the importance of constant temperature and proper humidity, types of freezers, processing rooms cold storage space, curing, and storage of smoked products, refrigeration equipment, the additional services necessary for profitable operation, and the future of locker plants.

E. M. G.

(655) Erdman, F. S., "Bibliography of Literature on Frozen Foods." Refrig. Eng. 48, No. 5, 374-80, 414, 416, 418, 420, 422, 424, 426, 428, 430 (1944). - Important periodical papers, books, and bulletins issued since 1935 are listed and grouped chronologically under main subject headings designating branches of large subject; authors and serial numbers indicating their various papers are listed at close of bibliography.

E. I. 1944, 889.

(656) Esselen, W. B., Jr., "Nutritional Values of Quick Frozen Foods." Quick Frozen Foods 1, No. 8, 10-36 (1939).

(657) Evans., "Standards for Quick Frozen Foods." Quick Frozen Foods 3, No. 5, 13, 35 (1940).

(658) Ewell, A. W., "Humidity Measurements in Freezer Rooms." Refrig. Eng. 27, 131 (1934). - Discussion of discrepancy between German and American methods of measuring humidity in cold rooms.

W. B. C.

(659) Ewell, A. W., "The Use of Ozone in Cold-Storage Plants." Ice and Refrigeration 91, 295-6 (1936). - Except in special cases ozone is the best available agent for improving and prolonging the storage of food stuffs - the growth of mold on eggs stored in an atmosphere of high humidity can be prevented by maintaining an ozone concentration of 15. - 2.1 p.p.m. in air of the aisles between the egg cases. This gives a concentration of about 0.6 p.p.m. of ozone within the egg cases. The growth of mold on meat can also be prevented by maintaining an ozone concentration of about 1.5 p.p.m. in the storage room atmosphere. The safe storage period of many fruits and vegetables can be prolonged by the use of ozone. High concentrations of ozone (50 p.p.m.) may injure such products as bacon, lard, butter, cream, dried eggs, meat and bananas. The effect of ozone on oxidizable material is roughly proportional to the amount of ozone in contact with the surface.

C. A. 30, 8407 (1936).

(660) Ewell, A. W., "Freezing of Foods." Section in Refrigerating Data Book. New York: Am. Soc. Refrig. Eng., 1940. Vol. I, pp. 185-192.

(661) Ewell, A. W., "The Tenderizing of Beef." Refrig. Eng. 39, 237-40 (1940). - Discuses measurement of tenderness, changes of palatability during storage, nature of tenderizing process, and influence of temperature upon speed of tenderization.

W. B. C.

-F-

(662) Fabian, F.W., Home Food Preservation. Salting, Canning, Drying, Freezing. New York: Avi Publishing Company. 1943. - Developments in food preservation have followed several basic methods, including salting, canning, drying, and freezing. In all of these procedures, application of scientific principles are required and utilized. Each of the methods is taken up separately. In recent years, quick-freeze methods have been developed on a commercial scale. The introduction of food locker plants has made low temperatures storage practical for home uses. In this method the bacterial counts of foods are reduced, but several of the types originally present still remain. Enzymes are inactivated before freezing so that natural flavor and color will be retained. Any or all foods, such as fruits, vegetables, meat and fish may be preserved by the aforementioned process. F.F.

(663) Farrell, K.T. and Fellers, C.R., "Vitamin Content of Green Snap Beans. Influence of Freezing, Canning, and Dehydration on the Content of Thiamine, Riboflavin and Ascorbic Acid." Food Research 7, 171-7 (1942). - Quick-freezing, when preceded by a 2 minute blanching (scalding) period, conserved vitamins B_1, B_2 (G) and C in snap beans (Bountiful variety) to the highest degree of all processing methods. Moderate losses of vivitamin B_1 occurred in canning, but the canned products lost about 45% after storage for a year. Riboflavin appeared to be stable to freezing, canning, storage and dehydration. It is apparently destroyed to some degree by enzyme action. The raw fresh beans contained approximately 63 milligrams of thiamine, 132 milligrams of riboflavin, and 26.5 milligrams of ascorbic acid per 100 grams (fresh basis). The average moisture content was 90.6%. Blanching was shown to be of the utmost importance in the conservation of vitamins. Dehydrated snap beans lost little of their vitamins B_1 and B_2 even on long storage. Vitamin C was almost totally lost by dehydration. About 30% of the thiamine and riboflavin was present in the liquid portion of the canned product. Approximately 50% of the ascorbic acid was found in the liquid contents. Ascorbic acid appeared to be stable to long storage after canning in glass or in tin containers. Fresh snap beans cooked for 30 minutes, with a ratio of beans to water by weight of 4:1, lost 24% of their ascorbic acid and about 10% of their thiamine content; there was no loss in riboflavin. Frozen beans cooked in the same manner lost, respectively, 12, 0 and 0% of their ascorbic acid, thiamine, and riboflavin content. Upon reheating canned snap beans for the table, the loss in ascorbic acid was only 6% with no loss in thiamine and riboflavin. C. A. 36, 5276 (1942).

(664) Farrell, K.T. "Vitamins Tested in Freezing, Dehydrating and Canning." Quick Frozen Food 5, Nos. 11, 12, 14-15, 21 (1943). - Of all processing methods quick freezing, preceded by two minutes blanching, conserved vitamins B_1, B_2, and C to the highest degree in Bountiful green snap beans. Canned or dehydrated snap beans are also good sources of vitamins B_1 and B_2 but dehydration destroys Vitamin C almost completely. B.A. 18, 38 (1944).

(665) Farrelly, W.M., "Faster Packaging of Frozen Foods." Food Indust. 17, 882-3 (1945). - Description of wide-opening bag-in-box container to speed

filling operations; also device mentioned to save time necessary for setting up containers.

F. F.

(665A) Fawcett, K.I. Freezing Fruits and Vegetables. Purdue University Agricultural Experiment Station Miscellaneous Publication 18, 1943. 5 pages.

(666) Fearon, W.R. and Foster, D.L. "Autolysis of Beef and Mutton." Biochem J. 16, 564-71 (1922). - Beef cannot be frozen and thawed again without marked physical changes taking place in the appearance, palatability, and general physical state of the meat, while nothing of the sort happened to mutton when similarly treated. Examination of the post-mortem autolysis of beef and mutton has thrown no light on their different behavior after being frozen. The processes in both are parallel, both at incubator and at low temperatures. In the case of mutton, equilibrium is reached at a higher percentage of soluble N than in beef; but the initial non-coagulable N is higher so that the curves are comparable. It is probable, therefore, that the differences in the 2 kinds of muscles are physical rather than chemical perhaps due to the structure and physical properties of the fibers. C.A. 17, 315 (1923).

(667) Feener, S.L., Palmer, V.W. and Fitzgerald, G.A. "Seasonal Variations in Vitamin C Content of Fresh Market Vegetables." Refrig. Eng. 34, No. 2, 101-5 (1937). - Spinach, broccoli, green beans and peas tested weekly over a period of one year; asparagus tested for about 5 months; these vegetables selected for study as they are principal green vegetables being preserved by freezing methods; emphasizes need for proper refrigeration throughout marketing period in order to preserve natural occurring vitamins in foods. Before Am. Chem. Soc. and Am. Soc. Refrig. Engrs. E.I. 1937, 901-2.

(668) Fellers, C.R. and Mack, M.J. "Utilization of Cold Packed Fruits in Frozen Dairy Products." Parts I and III. Strawberries and Raspberries. Fruit Prod. J. 9, No. 1, 3-11; No. 2, 46-7; No. 3, 106-9 (1929). - Temperatures of 0-10°F. were found desirable for quick freezing; for storage, 15° proved satisfactory. For small containers one day in the sharp freezer is sufficient. For the small ice cream maker, 1-5 gallon enamelled tin cans are preferable to barrels as containers. Fruit to sugar ratios of 2:1 and 3:1 are most desirable for cold packing strawberries; for raspberries, a 3:1 ratio. Freezing without sugar is unsatisfactory for ice cream. The sugar should be finely granulated and intimately mixed with the fruit at the time of packing. Cerelose (corn sugar) is not to be recommended for cold packing because it injures flavor and texture of fruits, lacks solubility and causes discoloration. Desirable strawberry varieties for cold packing are King Edward, Howard 17, and 25, Beacon, First Quality, and Marshall. Desirable raspberries are Herbert, Cuthbert, and St. Regis. Details for use of cold-packed fruits in ice cream are given. It is concluded that cold packed strawberries and raspberries are practically equivalent to fresh fruit for manufacture of fruit ice creams. B.A. 6, 2024 (1932).

(669) Fellers, C.R. "Public Health Aspects of Frozen Foods." Am. J. Pub. Health 22, 601-11 (1932). - A bibliography of 36 references is appended. C.A. 26, 4108 (1932).

(670) Fellers, C.R. and Mack, M.J. "Vitamin C Content of Strawberries and Strawberry Ice Cream." Indust. and Eng. Chem. 25, 1051-2 (1933); Ice Cream Trade J. 29, No. 8, 27-8 (1933). - Howard, Supreme, and Klondike varieties of fresh strawberries are excellent sources of Vitamin C, 2 gm. giving good weight gains and full protection from scurvey. Freezing with or without sugar has no harmful effect upon the Vitamin C content. When incorporated into ice cream strawberries show no measurable loss of vitamin C. This is attributed to the low temperatures at which agitation, air incorporation, and storage take place.

B.A. 8, 1673 (1934).

(671) Fellers, C.R. and Isham, P.D. "Vitamins C and A in Blueberries." J. Agric. Res. 47, No. 3, 163-5 (1933). - Vaccinium corymbosum, the high-bush blueberry is a good source of vitamin C; from 4-5 grams daily fully protects 300 gram guinea pigs. Under similar conditions the protective dose for V. pennsylvanicum, the low-bush species from Maine and Newfoundland, was 15-16 grams. The vitamin C content was unaffected by quick freezing. Some other methods of canning preserved the vitamin, while others caused marked losses. The vitamin A content of V. pennsylvanicum was low, probably less than 0.3 units per gram.

B.A. 8, 902 (1934).

(672) Fellers, C.R., Young, R.E., Isham, P.D. and Clague, J.A. "Effect of Fertilization, Freezing, Cooking and Canning on the Vitamins A and C Content of Asparagus." Proc. Am. Soc. Hort. Sci. 31, 145-51 (1934). - Variations in the amount of potassium and nitrogen applied as fertilizer did not appreciably affect the vitamin C or A content. Fresh or cooked green asparagus contained about 8 units of vitamin A per gram. The fresh asparagus contained about 0.5 unit of vitamin C per gram; cooked approximately 0.12 unit; and canned, 0.1 unit. Freezing did not cause loss in vitamin C content.

C.A. 30, 8419 (1936).

(673) Fellers, C.R. and Isham, P.D. Effect of Storage, Freezing and Canning on the Nutritive Value of Vegetable Products. Vegetable Growers Association America Annual Report, 1935. pp. 85-97. - A discussion, with special reference to vitamins.

C.A. 32, 258 (1938).

(674) Fellers, C.R. Effect of Processing on Vitamins in Fruits and Vegetables. Mass. Agri. Experiment Station Bulletin No. 338, 1936. 23 pages. - A review of recent research on the stability of vitamins to storage, drying, heat treatments, freezing, etc. 235 references.

C.A. 31, 6361 (1937).

(675) Fellers, C.R., Stepat, W. and Fitzgerald, G.A. "Ascorbic Acid (Vitamin C) content of Lima Beans as Affected by Shipping, Freezing, and Canning." J. Bact. 32, 359-60 (1936). - Vitamin C content of lima beans showed loss during defrosting and cooking, but also showed losses as high if not higher in iced-shipped beans, fresh-cooked beans, and can-cooked beans.

F.F.

(676) Fellers, C.R. and Stepat, W. "Effect of Shipping, Freezing, and Canning on the Ascorbic Acid (Vitamin C) Content of Peas." Proc. Am. Soc. Hort. Sci. 33, 627-33 (1936). - Titration values in mg. of ascorbic acid per gram were: market peas, 1 to 2 days old, 0.174; cooked market peas, 0.137; cooked frozen peas, 0.109; reheated canned peas, 0.057. Raw, freshly picked immature peas showed a mean value of 0.354. Peas defrosted for several hours showed a loss of nearly 70% of the amount present in the frozen state. Cooking either fresh or frozen peas caused loss of 6-12%. Shipments of storage peas in the pod for one or more days had a marked destructive effect. The titration results (2, 6-dichlorophenolindophenol) showed a close relationship to the Sherman guinea-pig assay method although the actual protective feeding levels were somewhat lower than those calculated from titration values.

F.F.

(677) Fellers, C.R. and Harvey, E.W. "Frozen Fish Fillets Used Successfully in Benzoated Brine Dip Experiments." Fishing Gaz. 57, No. 6, 36-44 (1940). - The use of a 5% salt brine containing 0.3% NaOBz was found useful in effectively prolonging the storage life of haddock and other fillets. The fillets are dipped in the special brine for about 2 minutes and then drained.

C.A. 35, 218 (1941).

(678) Fellers, C.R., Esselen, Jr., W.B. and Fitzgerald, G.A. "Vitamin B_1 and Vitamin B_2 (G) Contents of Vegetables as Influenced by Quick Freezing and Canning." Food Research 5, 495-502 (1940). - Controlled samples from the same lots of asparagus, peas, lima beans and spinach were quick frozen and canned by commercial methods and their vitamin B_1 and B_2 contents determined by the rat bioassay method with a reference curve of response. Fresh asparagus, peas, lima beans, and spinach contained 65, 133, 67 and 36 I.U. of vitamin B_1 and 53, 70, 122 and 145 Beurquin-Sherman units of vitamin B_2 per 100 grams, respectively. Asparagus, peas, lima beans and spinach retained 78,97, 46, 94% of their vitamin B_1 and 95, 100, 84 and 91% of their vitamin B_2 respectively, when quick-frozen; and 72, 60, 28 and 71% of their vitamin B_1 and 98, 100, 70 and 45% of their vitamin B_2 content, respectively, when canned. Because of the solubility of these vitamins in hot water, minimum blanching periods consistent with the processing requirements are recommended.

C.A. 35, 529 (1941).

(679) Fennema, G.R. "Quick-freezing Shrimp." Refrig. 49, No. 4, 22-24 (1931). - Quick-freezing and proper distribution answer to how market may be enlarged; saving benefits; curve representing freezing characteristics of ice made from pure water.

E.I. 1931, 1205.

(680) Fenocott. "New Progress in Frozen Food Processing." Food in Canada 1, No. 1, 36 (1942).

(681) Fenton, F. and Tressler, D.K. "Losses of Vitamin C During Commercial Freezing, Defrosting, and Cooking of Frosted Peas." Food Research 3, 409-16 (1938). - Abstract of C.A. 31, 2647. - The vitamin C content of fresh Thomas Laxton peas was reduced about 38% during the process,

other than actual freezing, involved in putting the peas on the market in the solidly frozen condition. The fresh peas contained approximately 0.25 micrograms ascorbic acid per gram while the cooked frozen peas contained approximately 0.12 micrograms per gram. The vitamin C content of frozen foods remained practically the same when they were taken directly from storage at -40° and held at 4.4° for 16 hours, or at 27° for five hours. The cooked frozen peas which were taken directly from storage at -40° retained 59% of their vitamin C and 36% was dissolved in the cooking water. The cooked frozen peas which had been held in the refrigerator retained 56% of their vitamin C and 39% was dissolved in the cooking water.

C.A. 32, 9318 (1938).

(682) Fenton, F. and Tressler, D.K. "Losses of Vitamin C During Cooking of Certain Vegetables." J. Home Econ. 30, 717-22 (1938); Cf. C.A. Food Research 3, 409 (1938). - Swiss chard, carrots and peas lost nearly 50% of their ascorbic acid in boiling. Most of this was recovered in the cooking water. Only 14% was lost in steaming carrots. Frosted peas and fresh peas were equal in vitamin C content when cooked.

C.A. 33, 759 (1939).

(683) Fenton, F. "Nutritive Value of Quick Frozen Foods." Refrig. Eng. 42, No. 2, 140-42 (1941). - The vitamin C content in quick frozen vegetables was much higher than that of fresh vegetables held even a few hours at room temperature. Because of the high solubility of the vitamins, frozen vegetables should not be thawed before cooking and should be cooked in a minimum of water.

B.A. 16, 592 (1942).

(684) Fenton, F. The Cooking of Frozen Foods: Their Nutritive Value. Cornell University Agric. Exp. Station Bulletin No. 628, 1943. 32 pages. - Thawing, cooking, and some recipes for frozen vegetables, fruits, poultry, meats, fish, eggs. Discussion of nutritive value of foods: changes during freezing of content of vitamins, minerals, proteins, carbohydrates and fats; changes during thawing; and changes during cooking.

B.A. 19, 45 (1945).

(685) Fenton, F. "Requirements for Locker Packing and Manner of Packaging." Quick Frozen Foods 5, No. 10, 24-5 (1943). - Gas-tight, moisture proof packages are necessary to prevent deterioration in quality of frozen foods during storage. The fundamentals of packaging meats, poultry, fruits, vegetables, and eggs are summarized briefly.

B.A. 18, 1117 (1944).

(686) Ferris, J.P. and Taylor, R.B. "Immersion Quick Freezing." Mech. Eng. 61, No. 6, 437-42, No. 12, 925-7 (1939); Ice and Refrig. 97, No. 3, 177-80 (1939). - Application of immersion quick freezing to rural processing industry; economic background and general statement concerning objectives. Bibliography. Before Am. Soc. Mech. Engrs.

E.I. 1939, 1005.

(687) Field, C. "Refrigerants 1918-1938." Chem. Industries 43, No. 3,

268-72 (1938). - Survey of development made during past 20 years in application of refrigeration to foods and other perishables; brief note on air conditioning as applied to comfort, and manufacture of small refrigerators; refrigeration as producer against refrigeration as consumer, is considered.
E.I. 1938, 1022.

(688) Filinger, G.A. and Mackintosh, D.L. Preserving Foods in Frozen Food Lockers. Kansas Agric. Exp. Station Circular No. 209, 1941.

(689) Filinger, G.A. and Mackintosh, D.L. Preserving Foods in Frozen Food Lockers. Kansas Agric. Exp. Station Circular No. 217, 1943. 40 pages. - Specific directions for preparing fruits, vegetables, and meats for such preservation.
B.A. 18, 685 (1944).

(690) Filinger, G.A. Preserving Food in Home Frozen Food Cabinets. Kansas State College Agriculture Experiment Station Circular No. 230, 1945.

(691) Filinger, G.A. "Preserving Small Fruits by Freezing." Proc. Am. Pomol. Soc. 1943 59, 140-8 (1945). - A list of recommended varieties, for preservation by freezing, of blackberries and dewberries, black raspberries, currants, red raspberries, purple raspberries, gooseberries, blueberries, cranberries, grapes, and strawberries in several states is given. Five methods of preparing small fruits for freezing are described: packed whole without sweetening; packed whole with sugar; packed whole with syrup; sliced or crushed and packed with sugar; and pulped or puree extracted. Honey may be substituted for part of the sugar, but will impart a slight honey flavor to the product. Corn syrup alone is not a satisfactory substitute for sugar. Dextrose is not as satisfactory as cane sugar and more of it is required equally to sweeten the fruit. With some fruits, as strawberries, dextrose produces a purplish color when frozen. The normal color returns when the products thaw.
B.A. 19, 1541 (1945).

(692) Filinger, G.A. "Home Frozen Food Cabinets." Locker Operator 7, No. 5, 18-20 (1945). - What the probable effect will be on the frozen food locker industry.
F.F.

(693) Finck, J.L. "Mechanism of Heat Flow in Fibrous Materials." J. Res. 5, (1930).

(694) Fincke, M.L. "Vitamin Values of Garden-Type Peas Preserved by Frozen Pack Method: III Thiamin (Vitamin B_1)." Food Research 4, 605-11 (1939). - Frozen peas contained 2-4 micrograms of thiamine per gram. A 2 minute blanching period at 71° conserved the thiamine better than longer blanching periods. Hot water and steam blanching gave the same results.
C.A. 34, 1410 (1940).

(695) Fincke, M.L., Little, R., Redelings, E., and Perkins, J. "Further Studies of the Thiamine Values of Frozen Peas." Food Research 8, 123-7,

(1943). - No significant differences in thiamine values were found between fresh and frozen, and uncooked and cooked peas. Environment may affect the thiamine values of peas, as those grown in one place in 1938 contained significantly less thiamine that those grown in the same place the following year. On the other hand, certain varieties of peas grown in different parts of the state the same year contained approximately the same amount of thiamine. The thiamine values ranged from 2.0 gamma per gram in Laxton's Progress to 7.1 gamma per gram in World Record.

C.A. 37, 3845 (1943).

(696) Finn, D.B. "Refrigeration and the Fishing Industry." Refrig. Eng. 20, No. 5, 287-90 (1930). - Introduction of quick freezing extends market for frozen fish; fluctuations change internal pressure; "rusting" during cold storage; quick freezing systems at sea.

E.I. 1930, 1498.

(697) Finn, D.B. Advances in Knowledge of Freezing. Pacific Biology Station and Pacific Fisheries Experimental Station, Biology Board of Canada Progress Report, No. 14, 1932-33. pp. 3-5.

(698) Finn, D.B. Advances in Knowledge of Freezing, II. Pacific Biology Station and Pacific Fisheries Experimental Station, Biology Board of Canada Progress Report, No. 17, 1933. pp. 5-7. Cf. Refrig. Eng. 28, 254 (1934).

(699) Finn, D.B. "Denaturation of Fish Muscle Proteins by Freezing." Contrib. Can. Biol. Fisheries 8, 313-20 (1934). - On keeping fish muscle juice for 84 days at -2°, about 24% of the total protein is denatured, as measured by the percentage of the total coagulable N which becomes precipitated. At -20° the denaturation in the same time is only 3%.

C.A. 28, 4795 (1934).

(700) Finn, D.B. "Advances in Knowledge of Freezing, II." Refrig. Eng. 28, 254 (1934). - Discussion of quick freezing in relation to freezing of fish. Effective rate of freezing defined as the time taken for the temperature at the center of the fish to pass from 41° F. to 23°F.; the critical rate of freezing is the slowest rate at which tissues may be frozen without appreciably breaking down the cell structure, or, is actually the lowest rate of freezing that can be called rapid freezing. In addition to fast rate of freezing, there must be sufficient extent of freezing. States that fish should be cooled from 41° to 23° F. in 48 minutes and the temperature be rapidly lowered to -4° F. and then stored at this temperature until used.

W.B.C.

(701) Finn, D.B. "Freezing and Storage of Fish: A Review and an Analysis of the Problem." Refrig. Eng. 32, 141-3, 158 (1936). - The physical and chemical changes occurring during the freezing and storage of fish are discussed.

C.A. 30, 7709 (1936).

(702) Finnegan, W.J. "Preserving Citrus Juice by Freezing." Ice and Refrig. 88, 51-4 (1935). - The citrus juice packed in cans and under vacuo is rapidly frozen by revolving the cans during passage through the freezing tube and by causing turbulent flow of the cold brine over the surface of the revolving cans.

C.A. 29, 5194 (1935).

(703) Finnegan, W.J. "Quick Freezing Foods--Economic Status as Applied to Freezing Methods and Apparatus Design." Ice and Refrig. 94, No. 1, 45-8 (1938). - Discussion of process of quick freezing as related to other factors; more efficient, economical and adequate facilities are needed; technological, mechanical, and economic problems are being solved.

E.I. 1938, 1023.

(704) Finnegan, W.J. "Food Freezing--Engineered for Quality and Economy." Ice and Refrig. 95, No. 5, 355-61 (1938). - Methods used by National Fruit Canning Co., which operates plants in Seattle, Burlington, and Chehalis, Washington, in freezing various kinds of foods; pea processing and freezing; multi-stage freezing; track equipment; air distribution; produce quality as affected by freezing; air distribution versus velocity; compressor operation. Cf. Food Indust. 10, 622-4, 675-7 (1938). - "Quick Freezing Foods with Multi-Stage Tubular Freezers."

E.I. 1938, 1023.

(705) Finnegan, W.J. "Factors to be Considered in Evaluating Food Freezing Methods." Ice and Refrig. 96, No. 5, 429-32 (1939); Refrig. Eng. 37, No. 6, 381-3 (1939). - Direct contact, indirect contact and conduction freezing are discussed; speed of freezing; test freezing versus commercial freezing; fixed versus flexible facilities; rapid freezing some products; principal factors affecting valuation. Cf. Quick Frozen Foods 1, No. 10, pp. 14-18.

E.I. 1939, 1005.

(706) Finnegan, W.J. "Desiccation of Frozen Foods." Ice and Refrig. 97, No. 2, 111-3 (1939); Refrig. Eng. 38, No. 4, 223-5 (1939). - Causes of food desiccation; freezer storage conditions exemplified; temperature variations; packaging; storage design. Before Calif. Frosted Food Industry Conference.

E.I. 1939, 1005.

(707) Finnegan, W.J. "Performance Data Determined for New Food Freezing Plant." Food Industries 12, Nos. 2, 3, 64-5, 48-9 (1940). - Equipment installed at Exmore, Va. plant of John H. Dulaney and Son, for freezing food products; freezing equipment is multi-stage tubular freezer, and includes freezing tube adapters which permit quick freezing in packages and individual freezing of loose or bulk materials; practical operating data and information on freezing poultry, packaged produce, and on defrosting freezing equipment.

E.I. 1940, 1023.

(708) Finnegan, W.J. "Acceleration of Low Temperature Heat Exchange." Ice and Refrig. 98, No. 5, 409-10 (1940). - For purpose of illustrating

importance of efficient heat transfer, author considers multiple exchange of heat which occurs in typical air blast food freezing system, together with advantage gained by accelerated condition of heat exchange as well as disadvantages resulting from slow or inefficient exchange of heat between food and air cooling surfaces; other pertinent factors affecting efficiency of food freezing and handling also considered.

E.I. 1940, 1022.

(709) Finnegan, W.J. "Food Freezing." Ice and Refrig. 98, No. 6, 457-8 (1940). - Freezing preservation of various foods requires separate treatment for each kind of food if best results are desired; recent developments in various methods of applying basic methods of heat exchanged outlined: improvements in food freezing methods and apparatus enumerated; major considerations which should form basis of design or selection of suitable food freezing equipment. Before Nat. Assn. Practical Refrig. Engrs.

E.I. 1940, 1022.

(710) Finnegan, W.J. "Food Freezing in Cans." Ice and Refrig. 99, No. 3, 203-6 (1940). - Pure Fruit Juices, Inc. of Detroit, Mich., has installed Finnegan Spiral tubular freezer in its plant at Los Angeles, for purpose of quick freezing various kinds of fruit juices and other foods in enamel lined tin cans for retail, wholesale and institutional trade; description of freezing apparatus. Cf. Quick Frozen Foods 3, No. 3, 10-11, 25, 34 (1940).

E.I. 1940, 1022.

(711) Finnegan, W.J. "Modern Food Freezing Accompanies Ice Making." Ice and Refrig. 99, No. 6, 419-23 (1940). - Recent advancement and rapid progress in preservation of foods by freezing presents broad field for expansion. Consideration of possibilities in this respect together with description of practical commercial application.

E.I. 1941, 1026.

(712) Finnegan, W.J. "Quick Freezing and Storage of Poultry." Ice and Refrig. 100, 69-76 (1941): Refrig. Eng. 41, 91-3. 175-8 (1941). - Detailed description of methods and equipment used in handling, eviscerating, freezing, and storage of poultry, at Fairmont Creamery Co., Omaha. Cf. Quick Frozen Foods 3, No. 7, 14-15, 39 (1941). - "Quick Freezing and Storage of Eviscerated Poultry." and U.S. Egg and Poultry Magazine 45, 90-94, 123-6 (1941). - "The Quick Freezing and Storage of Poultry."

E. I. 1941, 1027.

(713) Finnegan, W.J. "Effect of Frozen Mass Formations on Freezing Rate of Foods." Refrig. Eng. 42, No. 4, 233-7 (1941); Ice and Refrig. 101, 403-9 (1941). - Tests were carried out with different types of freezing procedures (direct contact, immersion in still water, still air) to measure final freezing point; results showed that each food has optimum point of solidification which will give highest freezing rate at given temperature regardless of method used.

E.I. 1941, 1026.

(714) Finnegan, W.J. "Multi-Stage Freezer Reverses Heat Transferring Cycle

for Dehydrating Foods." Ice and Refrig. 103, No. 1, 45-7 (1942); Refrig. Eng. 44, No. 4, 225-9 (1942). - By reversing some of the fundamental principles involved in method and apparatus for multi-stage freezing of foods some remarkable results in dehydration of foods have been produced in the past two years under test conditions which approach closely that which is most desirable in commercial practice.

E.I. 1942, 922.

(715) Finnegan, W.J. "Economic Aspect of Pre-freezing Bulk Foods Before Storage." Refrig. Eng. 42, No. 4, (1942).

(716) Finnegan, W.J. "New Competition for Freezers." Food Indust. 16, No. 3, 80-1 (1944).

(717) Finnegan, W.J. "Drying of Foods by Freezing." Ice and Refrig. 106, No. 1, 49-53 (1944). - Description of multi-stage method of heat or moisture exchange for preservation of foods by freezing or dehydrating; multi-stage freezer as installed at Brockport Cold Storage Company's plant, Brockport, New York; freezing unit has two freezing tubes, each containing 14 heat transferring stages or separate compartments consisting of one pre-cooling compartment, 12 freezing compartments and one food tempering compartment. Bibliography.

E.I. 1944, 889.

(718) Finnegan, W.J. "Freezing Foods in Glass." Ice and Refrig. 107, No. 1, 21-2, 60 (1944); Food Packer, June, 1944. - Methods and equipment used by Pure Fruit Juices, Inc. in freezing, packaging, and distributing quick frozen orange and lemon juice in glass containers.

E.I. 1944, 413.

(719) Fisher, A.R. "Theory and Practice of Quick-Freezing of Berries and Other Fruits in Sugar Syrup." Quick Frozen Foods 1, No. 6, 23-4 (1939).

(720) Fisher, A.R. "Quick Freezing of Poultry Shows Possibilities." Quick Frozen Foods 1, No. 6, 29-30 (1939).

(721) Fisher, D.F. "Report of Committee on State and National Experimentation." Ice and Refrig. 80, No. 6, 453-56 (1931). - Research covering refrigerating of meat, dairy products, fruits and vegetables at State and privately endowed institutions; preservation of fruits and vegetables by freezing; miscellaneous studies involving refrigeration. Before Am. Inst. Refrig.

E.I. 1931, 1206.

(722) Fisher, D.F. "National Cold Storage Laboratory." Refrig. Eng. 40, No. 3, 143-4 (1940). - Details and description of cold storage laboratory at the United States Horticultural Station, Beltsville, Md.

(723) Fisher, D.F. "Bibliography on Refrigeration." Refrig. Eng. 42, No.

4, 247-8 (1941). - List of references to articles on refrigeration of agricultural products appearing in technical literature during 1939 and 1940. Before Am. Soc. Refrig. Engrs.

E.I. 1941, 1025.

(724) Fitzgerald, G.A. and Fellers, C.R. "Carotene and Ascorbic Acid Content of Fresh Market and Commercially Frozen Fruits and Vegetables." Food Research 3, 109-20 (1938). - The green vegetables are good sources of carotene. Freezing fruits and vegetables results in little or no loss in carotene content. Likewise the storage of frozen fruits and vegetables in sealed cellophane wrappers in the absence of light is not destructive to carotene. Marked variations occur in the ascorbic acid content of vegetables and fruits sold in public markets; e.g. fresh spinach on the Boston market varied from 0.15 micrograms of ascorbic acid per gram in July to a maximum of 0.68 micrograms per gram in November. Often the shipped-in vegetable is higher in ascorbic acid than is the home grown. The data indicate that climate, soil, and possibly other factors besides maturity have an important bearing on the ascorbic acid content of foods. Dehydroascorbic acid was not found in frozen Brussels sprouts, cauliflower, pineapple, green beans or strawberries. Both fresh and frozen broccoli contained approximately 1.0 micrograms of ascorbic acid per gram; fresh green beans 0.135, frozen green beans 0.065; fresh lima beans 0.24, frozen lima beans 0.2; fresh peas, 0.25, frozen peas 0.17; fresh asparagus 0.24; stored 24 hours 0.16; frozen 0.20; fresh and frozen sweet corn 0.08. By careful selection of varieties and the use of succulent, immature vegetables, frozen foods of high ascorbic acid content can be packed. Cf. Quick Frozen Foods 1, No. 3, 44-49 (1938).

C.A. 32, 5949 (1938).

(725) Fitzgerald, G.A. and Nickerson, J.T.R. Effect of Time and Temperature on Holding Undrawn Poultry Upon Its Quality. Proceedings of 7th World's Poultry Congress, 1939. pp. 509-512.

(726) Fitzgerald, G.A. "Effects of Freezing on Vitamin C Content of Vegetables." Refrig. Eng. 37, No. 1, 33-9 (1939). - What vitamins are; control of enzymes; loss of ascorbic acid of different varieties of vegetables; effects of delays between harvesting and blanching; effect of variety, maturity, blanching, cooling, freezing, storage temperatures, methods of distribution, cooking, etc. Before Food Preservation Council, Univ. of Tenn.

E.I. 1939, 1006.

(727) Fitzgerald, G.A. "Quality Control of Frozen Foods Production." Refrig. Eng. 37, No. 5, 306-9, 340 (1939). - Paper deals with general requisites of satisfactory quality control; quality of raw materials; sanitation control; protection in distribution; sales channel control. Before Am. Soc. Refrig. Engrs. E.I. 1939, 1005.

(728) Fitzgerald, G.A. "Trends in Refrigeration of Foods." Ice and Refrig. 106, No. 2, 103-5 (1944). - Discussion of broader aspects of preservation of foods by refrigeration; refrigeration on farm; farm freezers; locker plants; commercial quick freezing preservation; freezing fish at sea; packaging of frozen foods. Before Am. Soc. Refrig. Engrs.

E.I. 1944, 890.

(729) Fitzgerald, G.A. "Quality in the Locker Plant." Quick Frozen Foods 8, No. 5, 126-7 (1945). - Points out the pitfalls which face the operator who desires to undertake blanching and other processing of vegetables and fruits in locker plants. For quality, incoming produce should be handled through a refrigerated holding room--(34°-38° F.). Patrons of locker plants must be instructed on farming and harvesting end to avoid rusting, wilting, etc. Most meats should be slowly, thoroughly defrosted; vegetables, partially defrosted so they will not clump together, thus exposing maximum surface in cooking; corn on cob should be more thoroughly defrosted, but not too much, or the corn will be soggy. Bacteriological count important in packaging cooked foods for freezing.

B.J.W.

(730) Flint, L.S. "Loose Pack Frozen Foods Provide Attractive Displays." Ice and Refrig. 95, 364 (1938). - Items such as lima beans and green peas are frozen loose on trays and are thus free flowing and easily handled. These make attractive displays when packaged in cellophane bags in open cartons.

F.F.

(731) Forbes. "Use of Frozen Foods in Making Jams and Jellies." Frosted Food Field 1, No. 5, 6-7.

(732) Forgasc, J., Ruth, W.A. and Tanner, F.W. "Freezing of Apple Juice." Food Research 10, No. 2, 148-59 (1945). - Study made on the effects of alternate freezing and thawing and variation in time of thawing upon pH, titratable acidity, refractometer reading and upon microflora of frozen apple juice.

F.F.

(733) Foster, D.L. "Some Problems of the Freezing of Beef Presented to a Biochemist." Proc. Fourth Intern. Congress of Refrigeration 1, 247-50 (1924). - Cf. Fearon, W.R. and Foster, D.L. Biochem. J. 16, 564 (1922). - Method and rate of freezing have considerable effect on the autolysis of beef. In unfrozen beef, the soluble N content on autolysis increased from about 10.5 to about 13% of the total N in 10 days and then remained constant. In beef frozen in the ordinary way in air at -8° the soluble N increased from about 10.5 to 16% in 20 days; while in beef frozen by immersion in saturated brine at -8° revealed an autolysis curve was strictly comparable to that of unfrozen beef. Absence of "drip" on thawing brine frozen beef would indicate that by this method any extensive damage to the cell is avoided. The brown color produced to a depth of about 0.5 inches in brine frozen beef was shown to be due to the formation of methemoglobin. Prevention of the discoloration was successfully carried out on a small scale by reduction of the oxihemoglobin to hemoglobin previous to freezing; but it is doubtful if such a process could be successfully applied on a commercial scale on beef quarters. Addition of NH_3 to an ordinary NaCl brine also prevented discoloration, which was found to be due to formation of an alkaline derivative of methemoglobin.

C.A. 20, 784 (1926).

(734) Foster, E.D. "Quick-Freezing and the Perishable Food Problem." Harvard Business Rev. 12, 243-52 (1934). - The purpose of this paper is to review the progress made by quick freezing and to point out its future

possibilities in the solution of this problem. The article includes the technical advantages of quick freezing over sharp-freezing for flesh and vegetable products; some of the features that have helped the Birdseye process to dominate the field; and a discussion of the factors affecting the future growth of quick-freezing and its effect upon other food producers and upon curtailing waste incurred in distribution of perishable foods.

E.M.C.

(735) Fox, H. "Structural Changes in Fish after Freezing." Ice and Cold Storage 33, No. 383, 41-42, 48 (1930). - Results of histological investigations carried out by V.D. Vladykoff, of Paris, when freezing in air and by Farotschenzeff process; freezing methods; freezing in solution; technique of investigation.

E.I. 1930, 1499.

(736) Frederick, J.H. "Warehouses and Quick Frozen Foods." Refrig. Eng. 40, 19, (1940). - This article points out the advantages of the use of cold storage warehouses for the producer of quick frozen foods. The highly trained personnel of these warehouses render services to their clients which the individual producer cannot economically duplicate in all cities.

E.M.C.

(737) French, C.M. "Sugar Plays a Role in the Frozen Pack." Western Frozen Foods 1, No. 6, 7 (1940). - In general, syrup is preferable as a packing medium to dry sugar because of its total solubility, protection against oxidation and preservative properties against micro-organisms. Dry sugar packs extract more juice from the fruit causing excessive leakage and sogginess after defrosting. Fruits packed in heavy syrups cool more rapidly than those packed in light syrups. There was less expansion during freezing when heavy syrups were used.

C.A. 35, 220 (1941).

(738) Friedrich, G. "Carl von Linde: The Hundredth Birthday of the Founder of Modern Refrigeration Technique." Chem.-Ztg. 66, 249-53 (1942).

C. A. 37, 2969 (1943).

(739) Funk, E.M. "Some Factors Influencing Rate of Cooling, Freezing and Thawing in Dressed Poultry." Ice and Refrig. 103, No. 5, 291-4 (1942).

E. I. 1942, 923.

(740) Funk, E.M. "Some Factors Influencing the Rate of Freezing in Dressed Poultry." Quick Frozen Foods 5, No. 2, 18-19 (1942). - Freezing rate in different size poultry and in different sections of the same bird, effect of air movement and temperature on the rate of freezing are expressed graphically and discussed.

B.A. 17, 790 (1943).

(741) Gollenkamp, E. W., "Quick Freezing Temperatures." Refrig. Eng. 20, 30-2 (1930). - K. discusses the various practical methods of obtaining such temperatures as -40°, -50°, and -60° F. The methods considered are compound carbon dioxide compression, compound or booster ammonia compression, single-stage carbon dioxide compression with -10° to 10° F. brine for cooling the condenser, and single-stage ammonia compression system with 10° to 20° F. brine for cooling the condenser. The relative advantages of the systems are also discussed.

C. A. 24, 5086 (1930).

(742) Garcia, T. M. and Fuster, J. S., "Frozen Meats." Rev. Hig. Sanidad Pecu. Madrid 10, 245 (1920). - From the analysis of a sample of frozen lamb and ox and a pepsin digestion of fresh and frozen lamb and ox meat the authors conclude that the treatment of meat subjected to freezing does not impair its quality and digestibility.

C. A. 15, 2132 (1921).

(743) Gardner, B. W., Jr., "Storing Fruits, Vegetables, and Meat in a Freezer-Locker." Consumer's Res. Bull. 12, 14-18 (1943). - Varieties of fruits rated with respect to their adaptability to satisfactory freezing-storage; table II.

W. B.C.

(744) Gardner, V. R., "Cell Structure and Freezing." Refrig. Eng. 39, No. 4, 233 (1940). - Exactly how freezing affects cell structure of fruits and vegetables explained.

E. I. 1940, 1022.

(745) Garnett, F. E., "Refrigeration on the Fruit Farm." Brit. Assn. Refrig. Proc. 32, 65-8 (1935-6). - A review of the results of the freezing of fruit, and the storage of fruit in inert gases.

C. A. 31, 2697 (1937).

(746) Gavrilova, C., "The Pros and Cons of Cooperatives (I & II)." Quick Frozen Foods 8, 60-63, 70, 71 (1945). - Since approximately one-fourth of the frozen fruit and vegetable pack of the northwest is frozen by cooperatives ... survey is presented covering the pros and cons of this type of operation.

B. J. W.

(747) Geer, L. P., Murray, U. M. T., and Smith, E., "Bacterial Content of Frozen Hamburg Steak." Am. J. Pub. Health & Nation's Health 23, No. 7, 673-6 (1933).

(748) Gettkandt, A., "Changes Occurring in Frozen Perch or Bass Fillet Upon Storage." Deut Fischerei-Rundschw 63, 167-8 (1940). - Description of the autolytic changes occurring after eight months storage at -22° C.

C. A. 36, 5910 (1942); C. Z. II, 2830 (1940).

(749) Gibbons, N. E., "A Bacteriological Study of 'Ice Fillets'." Contr. Canadian Biol. & Fish 8, 24, 303-310 (1934). - Twenty-nine "ice fillets" (mostly haddock) were examined bacteriologically after varying periods of storage at -5° to -18° C. Quantitative examinations would indicate that after an initial decrease due to freezing, there is little change in number of bacteria in fillets at -18° for one year; a gradual decrease follows. In fillets stored at -5° there is an increase after about fifty weeks. A psychrophilis flora seems to predominate after long storage. Sixty-eight species and varieties of bacteria were isolated and grouped, as far as possible, according to the species they most closely resembled; twenty strains of achromobacter could not be placed.

B. A. 9, 1335 (1935).

(750) Gibson, E. T., "Freezing and Merchandising Meat." Quick Frozen Foods. 2, No. 1, 18-19 & 39 (1939).

(751) Gibson, E. T., "Quick Frozen Industry." Ice & Refrig. 101, 121-5 (1941). - Present standard and future outlook for frozen foods discussed. Before Am Indust. Refrig.

E. I. 1941, 1026.

(752) Gibson, E. T., "Increased Volume of Frozen Foods." Ice & Refrig. 104, No. 3, 165 (1943).

(753) Gleim, E. G., Tressler, D. K., Fenton, F., "Ascorbic Acid, Thiamine, Riboflavin, and Carotene Content of Asparagus and Spinach in the Fresh, Stored and Frozen States." Food Research 9, 471-90 (1944). - Fresh Mary and Martha Washington asparagus contained on the fresh basis 43.2, 0.187, 0.318, 0.432 milligrams of ascorbic acid, thiamine, riboflavin, and carotene, respectively. The values for fresh Heavy Pack spinach were 29.8, 0.087, 0.213, 4.063 milligrams. During storage for 24 hours at 18.8° to 25.5° C. asparagus lost 40, 3, 22, and 9% and spinach lost 29, 2, 5, and 8% of the ascorbic acid, thiamine, riboflavin and carotene, respectively. During storage for 1 week at 0 to 4.4° C. the losses for asparagus were 57, 18, 27, and 14% and for spinach 35, 15, 17 and 5%. During freezing procedures the losses of these vitamins were 24, 28, 42, and 24% for asparagus and 63, 51, 40, and 13% for spinach. Carotene was stable during cooking. Cooking the fresh stored and frozen products in a small amount of water in a covered pan resulted in less loss of other vitamins than the use of a large amount in an open pan. Most of the loss of thiamine and riboflavin was due to the vitamins dissolving out into the cooking water. There was no appreciable real destruction of thiamine. Slightly less riboflavin was destroyed in the procedure using little water.

C. A. 39, 1703 (1945).

(754) Glennie, A. E., Index to the Literature of Food Investigation. Second Edition. Dept. Sci. & Indust. Res., His Majesty's Stationery Office: London, 1930. pp. 108 & 88. - Abstracts of recent papers are given.

B. A. 8, 4 (1934).

(755) Glennie, A. E. and Alexander, C. Index to the Literature of Food Investigation. Dept. Sci. & Indust. Res., His Majesty's Stationery Office:

London, 1930. Vols 3 & 4. pp 151-225, 223-303. - Annotated bibliographies each contain approximately 500 literature citations classified under the headings: meat; pig flesh; poultry & game; fish; eggs; dairy produce; fats and oils; fruits & vegetables; grain products, crops, and seeds; theory of canning; theory of chilling & freezing; bacteriology; mycology, engineering; and miscellaneous, with author indexes.

B. A. 19, 47 (1945).

(756) Godsil, H. C. Conclusion and Summary of Detailed Progress Report No. 2 on the Refrigeration of Tuna. California Division of Fish and Game, Mimeographed report, July 15, 1940.

(757) Golovkin, N., "Modification Undergone During Storage by Meat Frozen by Various Processes." Myasnaya Ind. 10, No. 2, 29-34 (1939); Chemie and Industrie 42, 654 (1939). - In meat that has been frozen by the accelerated process, formation of lactic acid during storage is smaller than in meat frozen by the standard process, rapid cooling retarding the decomposition of glycogen. Though variations in the physiochemical constituents seem to indicate that meat which has been frozen rapidly keeps less well, organoleptic tests would seem to indicate the contrary. This contradiction is due to the fact that, in rapidly frozen meat, decomposition of glycogen and of lactic acid plays a relatively unimportant part, the crust protecting the meat against the development of the microflora.

C. A. 34, 2944 (1940).

(758) Goresline, H. E., "The Microbiological Examination of Frozen Fruits and Vegetables." J. Assoc. Official Agri. Chem. 25, 736 (1942). - At present there seems to be considerable variation in the handling of samples and bacteriological procedure used in laboratories doing this work, but it is believed possible to develop from these techniques a set of methods that will be acceptable to all laboratories concerned.

C. A. 36, 6688 (1942).

(759) Goresline, H. E., et al., "Microbiological Examination of Foods - Tentative Methods for the Microbiological Examination of Frozen Foods." Am. J. Public Health 36, No. 4, 332-5 (1946). - Report of committee on Standard Methods for the Microbiological Examination of Foods. Use of a mechanical blender and choice of tryptone glucose extract agar; macroscopic and microscopic methods of examination of frozen vegetables and fruits.

F. F.

(760) Gould, C. J., "Our Experience With Seed Treatments In Western Washington Agriculture." Western Canner and Packer 37, No. 4, 47, 49, 51 (1945). - Seed treatment yields better crops in most vegetables tested: lima beans, snap beans, beets, chord, cucumbers, lettuce, peas, spinach, squash, tomatoes, have all shown good results; corn did not benefit much from treatment methods thus far used. Results are of interest to frozen food processors, as only high quality vegetables adapt well to freezing preparation.

F. F.

(761) Graham, M. N., "The Nutritive Value of Quick Frozen Foods." Fruit Prod. Jour. 21, No. 8, 243-6, 254 (1942). - The technological problems confronting the rapidly growing frozen food industry are briefly reviewed. Flesh foods are more successfully treated than plant foods because their colloidal gel is reversible whereas that of plant food is not. Quick frozen fruits and vegetables are practically as good as the fresh market product with respect to vitamin content, they are of more uniform quality, require no handling, posses most of the desirable characteristics of fresh material and can be cooked in shorter time.

B. A. 17, 1166 (1943).

(762) Gray, E. N. H., "Preservation of Foods." Domestic Eng. 51, No. 4, 80 (1931). - Methods of freezing; theoretical consideration of heat in refrigerating work. Before Royal Sanitary Inst.

E. I. 1931, 1206

(763) Grayson, R. V., "Packaging Frozen Foods and Fruit Juices." Paper Indus. 13, No. 1, 49-50 (1931). - Review of evolution; future outlook of paper industry in this line of endeavor.

E. I. 1931, 594.

(764) Grayson, R. V., "What Frozen Food Industry Means to U. S." Ice & Refrig. 82, 59-61 (1932).

(765) Grayson, R. V., "Freezing Fresh Milk." Milk Dealer 24, No. 7, 30-32 (1935). - Good-quality milk, uncontaminated with traces of metal, is pasteurized at 145° F. for 30 min., then homogenized and run into the receiving reservoir of the Grayson deserating-freezing unit where a vacuum of 28.8 in. is maintained for 20 min. This vacuum treatment operates to remove oxygen. The milk then passes to the freezing chamber where it is frozen to a slush, still under a high vacuum. The slushed-milk is then put into 1-gallon stone jugs of the thermic type., sealed under vacuum and frozen to a solid state. Milk preserved in this manner for 4 months was equal to fresh milk in quality. No deterioration in vitamin A or C content occurred during the storage.

C. A. 29, 4845 (1935).

(766) Grayson, R. V., "Quick Freezing Oysters." Quick Frozen Foods 1, No. 9, 14, 36 (1939).

(767) Grayson, R. V., "The Story of De-Veined Shrimp." Quick Frozen Foods 3, No. 9, 18-19, 38-9 (1941); Fishing Gazette 57, No. 8, 40, 50 (1941). - De-veined shrimp may be frozen and shipped in frozen state. De-veining process described. F. F.

(768) Grayson, R. V., "Engineerin Angles in Frosted Foods." Quick Frozen Foods 4, No. 6, 12-13, 38-40 (1942). - A discussion of the basic engineering aspects of the tunnel freezer, compressors and evaporators (including booster compressors), also a discussion of the need for and value of quality products. A description is given of the K & G Universal Super Froster, a short cycle air blast type with removable racks for handling the pro-

ducts; this has a capacity of two tons of frozen food per day, with a freezing temperature of -45° F. Pressure plate freezers are discussed; the process is said to be old, and the few "basic patents" issued are thus "most assuredly worthless." The wedge plate froster is discussed in some detail. Progress in immersion freezing is reported, with special reference to a neutral, non-toxic freezing solution of low eutectic point said to be under development by the writer's associates in Houston, Texas. Removal of the freezing solution from the product after freezing is said to be the greatest problem in immersion freezing; "this involves centrifuging or draining." Packages are discussed, including a new metal container which has a high heat transfer rate.

B. H. W.

(769) Grayson, R. V., "Distribution of Frosted Foods Via Strato-Refrigerated Cargo Plane." Ice and Refrig. 104, No. 6, 297-8 (1943). - Advantages for airplane transportation of frozen food products cited; discussion of railroad and motor truck transport in frozen foods field; although railroads have handled frozen foods to the best of their ability, author points out that air transport could be advantageous by keeping foods at temperatures best adaptable for maintenance of packer's quality.

E. I. 1943, 430.

(770) Greaves and Boggs, "Trends in Freezing Preservation of Foods." J. Home Ec. 37, No. 1, 23-6 (1945).

(771) Greely, A. W., "On the Analogy Between the Effects of Loss of Water and Lowering of Temperature." Am. J. Physiology 6, 122-28 (1901). - Study of parasite showed that animal cells could be held at low temperature not just in a state of suspended activity, but with accompanying morphological changes (much the same as those produced by loss of water). If temperature were again raised there would be a reverse process and restitution of vital activities. Important in studies on food freezing because of light it sheds on animal tissue changes under low temperature conditions.

F. F.

(772) Green, W. P., Hukill, W. V., and Rose, D. H., "Measurements of Heat Generated by Fruits and Vegetables." Refrig. Eng. 42, No. 4, 245-6 (1941). - To obtain greater accuracy in computing heat generated by fruits and vegetables, measurements of amount of carbon dioxide given off; were made and compared with estimates; measurements made at 65° and 45° F., article describes calorimeter used, and discusses results of measurements. Before Am. Soc. Refrig. Engrs.

E. I. 1941, 260.

(773) Greeve, Kolb, Finnegan and Drebl, "Problems Faced by the New Frozen Foods Packer." Quick Frozen Foods 7, No. 9, 42-45 (1945).

(774) Greene, V. R. H., "Quick Freezing of Poultry." Quick Frozen Foods 1, No. 2, 31-57 (1938); Refrig. Eng. 36, No. 2, 97-9 (1938). - A description of the three different methods used which are intended to produce the quick freezing effect on poultry. One of these is the air blast method, another system is the Birdseye method, another is the Z Process. The methods are

described briefly, and a comparison made between air frozen and quick-frozen poultry, pointing out the advantages of the quick frozen method for best results.

E. M. F.

(775) Greeve, V. R. H., "Humidification of Freezers." Ice & Refrig. 98, No. 4, 321-2 (1940); Refrig. Eng. 39, No. 5, 300, 306 (1940). - It is concluded that automatic control of humidity in freezer simplifies itself into limits which are reasonably satisfactory without necessity for complications which seemingly exist, and that when once increment of water to be evaporated per unit of time is determined, control of this amount of evaporation will produce results which are satisfactory. Before Assn. Refrigerated Warehouses.

E. I. 1940, 1023.

(776) Greene, V. R. H., "Protecting Frozen Foods Against Moisture Loss." Quick Frozen Foods 6, No. 7, 29, 40-41 (1944). - A study of criticisms of various air blast quick freezing systems in regard to moisture loss. Food must be handled quickly in the preparation stage of any process, or moisture losses will be high. It is recommended that fresh foods be sprayed with or immersed in cold water until reduced to a temperature of 35° F. before freezing. In the freezing unit, the work can be done in two divisions; in the first, the temperature can be reduced to just below the freezing point, allowing an external crust to form which shields the interior, then, in the second, removing the remaining latent heat and cooling to around 0° F. (N. B. the first treatment would presumably promote ice crystal growth.) High relative air humidities are essential in the first zone. Moisture loss also occurs in storage; even though vapor differences between the food and the room are only a fraction of those encountered during the freezing period, this small pressure difference is continuous and serious. Wrapping in cellophane cuts losses materially, but no paper is actually vapor-proof. High, (around 90%) humidities are recommended for cold storage warehouses at 0° F. A table shows vapor pressure differences between frozen foods having a mean temperature of 0° F. and freezer room air under different temperatures and relative humidities.

B. H. W.

(777) Greene, V. R. H., "A Vertical Conveyor Freezing Unit." Quick Frozen Foods 7, No. 6, 40-1 (1945). - After a description of the usual screen conveyor (tunnel) type and the truck and tray (tunnel) type of air blast freezers - both of which frequently use an entrance temperature of -20° F. and a travel time of about 30 minutes, the author states that a freezer should: (1) be efficient in operation, (2) save labor. (3) eliminate delays due to frosting troubles, (4) minimize shrink, (5) be of the continuous type and not a batch process, (6) be inexpensive in first cost. He then describes two quick-freezing plants, each of 2,000 pounds hourly capacity, which his organization built for blueberry freezing for the Northeastern Packing Co. A verticle type conveyor was used, arranged to receive a series of standard food trays in upward passage, the product trays traveling from the top to an automatic tray tilter from which the berries fell through a hopper into a freezing stora e room. Fifty trays, each of 20 pounds capacity were used, with a travel time of 30 minutes. The temperature of air coming off the trays has fallen to 20° F. in four steps, 10° F. in 14 steps, 0° F. at 24 steps upwards, and it then falls to -10° F. during the remaining 24 steps. Dehydration is minimized because the trays do not remain in contact with heated air, coming in contact, instead, with progressively colder and cold-

er air. Only two people are required to run each unit Fish fillets were frozen at the end of the blue-berry season. Space occupied per unit is 168 square feet, against 750 for the continuous best type conveyor and 280 for the truck and tray type of the same (2,000 pounds per hour) capacity. Direction of the air blast is reversed three times within the height of the unit. Two diagrams.

B. H. W.

(778) Gregg, R. S., "Frozen Pack a Boon to Berry Growers in Pacific Northwest." Comp. Air Mag. 36, No. 10, 3607-9 (1931). - A description of the steps developed by the technicists of the United States Department of Agriculture in handling, processing and distributing small fruit. The results of this work are also stated in this article.

E. M. F.

(779) Griffeths, E., Vickery, J. R., and Holmes, N. B. The Freezing Storage and Transport of New Zealand Lamb. Department Scientific Research Food Investigation Board, Special Report 41, Britain, 1932.

(780) Griffeths, E., "Physics of Food Storage and Transport." J. of Sci. Instruments, London 17, No. 12, 269-73 (1940). - Part of physics in refrigeration; quick freezing process; measuring instruments used.

E. B.

(781) Gripenberg, A. W., "Ottesen Fish Freezing and Cold Storage Plant." Ice & Refrig 62, No 6, 449-53 (1922). - Plant at Abo, Finland, which accompolishes freezing with cold brine in short time; insulation of cold storage rooms; construction of freezing tank.

E. I. 1922, 536.

(782) Guest, W. E., "Storage Locker Business." Refrig. Eng. 36, No. 4, 236-8 (1938). - Some successes and dangers in locker plants; errors to avoid; advantages of complete service.

E. B.

(783) Guest, W. E., "Some Problems in Preparation, Processing and Distribution of Frozen Food Products." Ice & Refrig. 96, No. 4, 339-41 (1939). - Notes on preparation of vegetables, fruits, poultry, and meats, packaging, methods of freezing, control of quality; cost of installations and operations.

E. I. 1939, 1005.

(784) Guest, W. E., "The Design and Cost of Locker Plants." Ice & Refrig. 96, No. 5, 437 (1939).

(785) Guest, W. E. Refrigerated Locker Plant Manual. Chicago: Nickerson & Collins Co., 1941.

(786) Haggerty, W.B., "Possibilities in Aerial Freezing and Transportation." Quick Frozen Foods 7, No. 8, 42, 63, 76 (1945). - A resume of the economic factors involved in aerial refrigeration. Costs are comparable to those of railroad transportation. Detailed comparisons are included.
B. H. W.

(787) Haines, R.B., "Growth of Microorganisms on Chilled and Frozen Meat." J. Soc. Chem. Ind. 50, 223-7T (1931). - A temperature of -5°C. is not low enough to inhibit microbial growth on frozen meat but -10°C. probably is. On the surface of carcasses held at -5°C. there is first a decrease in the number of microorganisms, followed by an increase due mainly to the growth of yeasts and molds. Varieties of Psuedomonas may continue to multiply and eventually cause spoilage.
C. A. 25, 4632 (1931).

(788) Haines, R.B., "Bacteria in Frozen Vegetables." Ice & Refrigeration 93, 199-20 (1937). - Most of the bacteria capable of growing on frozen substrates cease growth at -3°C. and most of the molds at about -7°C. Therefore, if frozen vegetables are stored at -10°C. it is reasonably certain that there will be no microbial growth on them. However, bacteria will grow rapidly before freezing and after thawing and care must be exercised to reduce growth to a minimum at these points. The only changes that can take place during frozen storage at -10°C. are slow chemical changes, slow changes due to enzymes in the tissues and slight changes due to enzymes in bacteria cells which may contaminate the frozen product.
C. A. 31, 8734 (1937).

(789) Haines, R.B., "Bacteria in Frozen Vegetables." Proc Brit Assoc. Refrig. 33, No. 2, 62-9 (1936-7). - Spoiled frozen peas had a pH value of 5. compared with 6.5 to 7.0 in good samples, and the bacterial count of the thawed liquor was approximately one million per cubic centimeter. Members of the colon-aerogenes group were isolated from it. To show that the organisms were capable of producing further spoilage, batches of freshly blanched peas were inoculated with a few cubic centimeters of the liquor, incubated for a short time, frozen and then compared with inoculated control experiments frozen immediately. Tables are given on bacterial counts of 10 grams of commercial peas aseptically shelled, and sources of infection of peas aseptically shelled, hand shelled, blanched and with washings from bruised shells at 20°C., 37°C. and 55°C. Experiments, not given, show that chlorophyll destruction is due to nonenzymic chemical change, enzymic change, bacterial changes and changes of pH. The public health aspects of frozen vegetables are discussed. Eight references.
C. A. 31, 8056 (1937).

(790) Haladay, J.F., "An Engineering Approach to Solution of Packaging Problems Involving Moisture Vapor Resistance." Paper Trade Jour. Tappi. Sect. 115, No. 14, 153-162 (1942). - The demands of war require alternative moisture-vapor resistant (MVR) materials. Moisture-vapor resistant tests are briefly discussed and a mathematical method is developed from interpreting laboratory date from them. Methods are also described for evaluating closure methods for determining the effect of vapor stresses produced by the

contained product and for calculating changes in its moisture content.
B. A. 17, 1166 (1943).

(791) Handley, R.D., "The Unit Package for Frozen Foods." Quick Frozen Foods 7, No. 10, 47, 81 (1945). - Description and discussion of retail packages containing several different compartments in which different vegetables, corned beef hash, etc., may be sold as a combination. Developed here by Sylvania Industrial Corp.
B. H. W.

(792) Hankins, O.G. Meat Studies. North Carolina Experiment Station, Bulletin No. 207, 1936.

(793) Hankins, O.G. and Hiner, R. L. "Freezing Makes Beef Tenderer." Food Ind. 12, 49-51 (1940). - Enzymes continue to act, though slowly, on meats held at freezing temperatures. Tenderizing may be due to both the mechanical action of freezing the meat and to enzyme action. An apparatus measuring shearing strength is described. The tenderizing action at -23.3° was much greater than at -6.7°. However, there was no difference between -6.7° and -40° in tenderness.
C. A. 34, 1761 (1940).

(794) Hankins, O.G. and Hiner, R.L., "Quality of Meat as Affected by Freezing Temperature." Refrig Eng. 41, 185-9 (1941). - cf. Food Ind. 12, 49 (1940). In the color of freshly cut lean of pork stored 10 months at 0°F. and at 18°F. the percentage of black had increased and the white dedreased. The hemoglobin is oxidized to methemoglobin, the latter brown in color. Change to yellowish color accompanies oxidation of fat, especially that of pork. Desiccation causes a change of color and gives a pithy appearance to the lean. Methods of destruction of trichinae in pork through freezing have been developed. At 14° F. and below meat can be stored without growth of microorganisms. Flavor of meat is difficult to evaluate. Rancidity can be approached most directly. Rancidity may be caused by oxidation, enzymes and microorganisms. Beef and lamb fats are comparatively resistant to oxidative changes. An undesirable degree of rancidity was found in pork after 2 months storage at 15° F., although there was little if any indication of rancidity after 12 months at 0° F. There was little difference in free fat acid content between freezer stored samples previously chilled at 33° and 50° F. Indications are that a difference in flavor of lean occurs between freshly slaughtered and freezer stored meat. Freezing appears to make beef more tender. Temperatures of -40° and -10° F. had more tenderizing effect than 20° F. Freezing at -10° F. 5 days after slaughter produced more tender beef than aging at 33° F.
Beef aged 35 days at 33° F. was further tenderized by freezing at -10° F. Freezing does not appear to have any appreciable effect on the nutritive value of meat.
C. A. 35, 6341 (1941).

(795) Hankins, O.G. and Hiner, R.L., "Evidence Strong That Freezing Tenderizes Meat." Quick Frozen Foods 7, No. 5, 39,82 (1944). - Steaks aged for five days at 34°F, then frozen at 20°, -10°, and -40° were 12%, 18% and 18% more tender than unfrozen samples. Maximum tenderizing of approximately 20% was secured when meat was aged for 15 days at 34°F., then frozen at -10°F. Histological examination showed that no ice crystals were

present in muscle fibers frozen at 18°; they became numerous at 0° and lower. Fiber disintegration was noted in meat frozen at -10° and below.

B. A. 19, 884 (1945).

(796) Hankins, O G., "Quality in Meat and Meat Products." Ind. Eng Chem. 37, 220-3 (1945). - The many factors influencing the wholesomeness, appearance, composition, tenderness, flavor, juiciness and nutritive value of meats are discussed. Animal factors such as breeding, age, sex, feeding or rate of growth are of especially great influence. Significant relations in respect to processing, preservation, preparation, including refrigeration, ripening, curing, smoking, freezing, dehydration, and cooking are discussed. Emphasis is placed on recent developments, expecially dehydration and freezing.

C. A. 39, 1937 (1945).

(797) Hardy, W. B., "A Microscopic Study of the Freezing of Gel." Proc. Roy. Soc. London 112 A, 47-61 (1926). - Study of phenomenon of formation of ice phase inside a gel, which results in spheres consisting of a sucession of shells, shows that (1) "save in very dilute gels the course of internal freezing is unusually intermittent" and (2) "instead of pure ice, a solid solution of gelatin and ice separates: Pure ice can and sometimes does form in the shape of rounded crystals, scattered throughout the gel, but in the common type of freezing, by spheres or rays spreading from centres of crystallization, it is always a solid solution which separates." Authors also found that, contrary to current concepts, the spongy structure found in gels after freezing and thawing is due to "de-solution on rise of temperature and fall of pressure of the solid solution." There were no indications that "it is at any stage a mixture of ice crystals and particles of dehydrated gel."

F. F.

(798) Hardy, W., "Some Recent Developments in Low-Temperature Research." Soc. Chem. Industry - J (Chem. Industry) 52, No. 3, 45-9 (1933). - Review of work carried out at Low Temperature Research Station at Cambridge biological laboratory where among other things, effect of relatively moderate cold upon organisms living or just dead is studied; range of temperature from 40 to -50°C.

E. I. 1933, 960.

(799) Harshaw, H.M., Hale, W.S., Swenson, T.L., Alexander, L.M. and Slocum, R.R. Quality of Frozen Poultry as Affected by Storage and Other Conditions. U. S. Department of Agriculture Tech. Bull. No. 768, 1941. pp. 1-20. - Determinations were made of the effect of 1, 2 and 3 years of storage at 0° and -20°F. on the quality of market poultry, as evidenced by loss of weight, external appearance, chemical changes, bacterial counts, and characteristics of the cooked birds. Half of the carcasses stored at -20°F. were drawn, the rest undrawn. The temperature of -20°F. was more effective in the maintenance of quality than 0°F. Drawing had little effect during customary periods of storage, but during prolonged storage, the flavor of thigh meat was adversely affected in undrawn birds.

B. A. 15, 1353 (1941).

(800) Harvey, R.B., "Relation of the Storage Temperature to Freezing In-

jury in Vegetables." Minnesota Hort. 57, No. 9, 261-8 (1929). - Data are given on storage conditions with regard to gain or loss of hardiness in vegetables. With storage temperature at or near 0°C., injury from freezing is less than after storage at 20°C. Storage at 5°C and 10°C. may show amounts of injury intermediate between that after storage at 0°C. and 20°C. At 20°C. cabbage and parsnips show only slight mechanical injury from ice masses although frozen at -9°C. Head cabbage shows much splitting of the heart when frozen at -14°C., and cells are all killed at -30°C.

B. A. 4, 1978 (1930).

(801) Harvey, R.B., "Conditions for Sucessful Storage of Frozen Fruits and Vegetables." Fruit Prod J. 12, 143, 151 (1933). - Theory of oxidation of certain products during storage: this produces charges in color and flavor. Freezing preservation of diced muskmelon, or rhubarb and rhubarb juice is given.

F. F.

(802) Harvey, R.B., Combs, W.B., Landon, R.H. and Child, A.M., "Extending the Use of Melons by Frozen Storage." Fruit Prod J. 15, 146-8 (1936). - Storage in waxed paper cartons of diced honeydew, watermelon and muskmelon for use in ice-creams. Methods of freezing, thawing, preparing ice-creams and ices.

F. F.

(803) Harvey, R.B., "Identification of Freezing Injury in Fruits & Vegetables." Proc. Amer Soc. Hort Sci. 35, 158-9 (1937-38). - A method for detecting freezing injury in fruits and vegetables by microscopic examination of clefts left in tissues by ice masses, and the relation of freezing injury to hardening in storage.

B. A. 12, 688 (1938).

(804) Haslacher, A B., "Wet Process Solves Problems in Packing and Transporting Frozen Foods." Food Ind 8, 438-9 (1936). - Slow or gentle freezing in 6-24 hours is effected in metal cylinders which are held in brine. The paper cartons are placed within these cylinders until frozen. Either water or sugar syrup is added to the foods. Vegetables are blanched to inactivate enzymes and deepen the color. Roughly, the amount of refrigeration required is about 10% above the amount required to freeze the same weight of water.

C. A. 30, 7233 (1936).

(805) Hastings, W. H., Fellers, C.R. and Fitzgerald, G.A. Effect of Freezing on Available Iron Content of Foods. Massachusetts Agriculture Experiment Station, Contribution 407 - preliminary contribution, 1941.

(806) Hastings, W.H., Fellers, C R. and Fitzgerald, G.S., "Effect of Freezing on the Available Fe Content of Foods." Am. Inst. Refrig. Proc. 30, 21-6 (1944); Expt. Sta Record 90, No. 1, 127 (1944). - Availability of Fe in frozen foods was determined (1) Chemically, as ionizable Fe by the dipyridyl method as modified by Elvehjem, et. al. (C. A. 28, 517) and (2) by bioassay, using rats made anemic on a diet of whole milk, sup-

plemented with 0.05 milligrams Cu daily, and involving their hemoglobin response to test doses of the food added to the basal milk diet (containing 0.05 milligrams Cu and 0.04 milligrams Mn) in amounts sufficient to supply 0.1 milligrams of Fe daily in comparison with the response of control rats receiving the same amount of Fe from $FeCl_3$ considered at 100% available. These two methods were in reasonable good agreement for the several foods tested, although in fresh and frozen haddock the chemical method gave markedly higher results. Expressed on the dry basis, the total Fe content of spinach, green snap beans, broccoli, asparagus, and peas equaled or exceeded 100 milligrams per 100 grams; haddock, chicken and sweet corn contained no more than about 50 milligrams per 100 grams; and Lima beans and strawberries were intermediate. The availability of the Fe by both the bioassay and the dipyridyl was higher in every case for the frozen foods as compared with the fresh, the proportion of total Fe available in the former (excluding Haddock) ranging from 97% as compared with values of from 33 to 75% for the corresponding fresh foods. "It appears from these data that commercial quick freezing of fruits, vegetables, poultry and fish does not adversely affect the availability of the Fe present, but on the contrary, seems actually to increase it."

C. A. 39, 1932 (1945).

(807) Havighorst, C.R., "What's Ahead for Frozen Foods." Food Indust. 16, 435-9 (1944). - A lengthy discussion of the problems of frozen foods industries emphasizing the closer integration of production and marketing required in the future. Frozen food packers need more scientifically trained men for better quality control, to keep prices lower, and to create new and refined methods of processing and handling in a more highly mechanized frozen food plant. There is a need for public education and greater advertising of the frozen foods.

E. M. F.

(808) Havighorst, C.R., "So You Are Going into Freezing?" Food Ind. 17, No. 12, 1471-5 (1945). - A check-list questionnaire is presented here as a guide for entering into the production and distribution of frozen foods. It will aid manufacturers and distributors in evaluating the problems and opportunities in this field.

E. M. F.

(809) Hawkins, Lon A., "Effect of Low-Temperature Storage and Freezing on Fruits and Vegetables." Am. J. Botany 9, 551-6 (1922). - Freezing points studied for fruits and vegetables, most lie between -.5°C and -2.5°C. Vegetables and fruits may be cooled below freezing point without actually being frozen - and in this state they keep well since vital processes are slowed down.

F. F.

(810) Heastie, B., "Heat Transfer and Food Plant Design." Food 4, 110-12 (1934). - A brief discussion showing the salient points of the various types of heaters, coolers, jacketed vessels and condensers used in the food industry.

C. A. 29, 2607 (1935).

(811) Heid, J.L., "Freezing Fruits and Vegetables in the Southwest." Refrig. Eng. 38, 286-8 (1939). - This is a discussion of the advantages of

freezing foods, the quality control necessary and the methods of freezing loose products. It also discussed experiments with varietal adaptability in South Texas of different fruits and vegetables with the methods and their suitability for frozen foods.

E. M. F.

(812) Heid, J.L., "The Freezing Preservation of Citrus Fruits and Juices." Fruit Producers Journal 20, No. 12, 375-377, 384, 389 (1941). - Frozen citrus juices are very satisfactory in flavor if properly treated before and after freezing. Since defrosting has to be timed carefully, their use has been limited to institutions. Methods for preparing frozen juices and sections are described, attention being given to suitable varieties, equipment, sanitation, extraction of juices, screening, sweetening, and blending, deaeration, containers, and filling, freezing, storage, transportation, and preparation for the table.

B. A. 16, 695 (1942).

(813) Heid, J.L., "Theory of Freezing." Section in Refrigerating Data Book. Fifth Edition. New York: American Society of Refrigerating Engineers, 1942, pp 217-224. - Introduction, objects and requirements for quick freezing, equipment and methods used, containers, storage of frozen foods, preparation for quick freezing, fruits, vegetables, bacteriology of frozen foods, nutritional aspects, outlook for quick freezing.

F. F.

(815) Heiss, R., "Study of Causes and Prevention of Discoloration of Frozen Meat." Zeit Fuer Die Ges. Kaelte-Industrie 37, No. 10, 193-4 (1930). Results of investigations of discoloring occuring with rapid freezing of fresh meat in brine, and conclusions regarding preventative measures.

E. I. 1930, 1501.

(816) Heiss, R., "Coloration of Frozen Meat." Z. Ges Kalte-Ind. 37, 189-94 (1930); Refrigerating Eng. 22, 95-8 (1931). - Coloration is due to the formation of methemoglobin, which is favored by increase in acidity. Freezing in envelopes or treatment with CO preserved the color.

C. A. 25, 5474 (1931).

(817) Heiss, R., "Investigation of the Cause and Prevention of Discoloration of Frozen Meat." Zeit Fuer Die Gesamte Kaelte Ind. Beiheft 3, No. 5, 1-57 (1931). - Report of Refrigerating Engineering Institute of Karlsrule Institute of Technology on results of investigation of cause and prevention of discoloration of frozen meat. Bibliography. Also in: Ice and Cold Storage 36, 121-22.

E. I. 1932, 1112.

(818) Heiss, R., "The Quantities of Water Frozen Out in the Freezing of Foodstuffs." Biochem. Z. 267, 438-51 (1933). - As determined by 2 different procedures, the amounts of water frozen out when fresh beef meat was frozen were functions of the temperature. No difference was observed in the amount of cooling required for slow or rapid freezing to the equilibrium condition.

C. A. 28, 2073 (1934).

(819) Heiss, R., "Rapid Freezing Research " Ice and Cold Storage 36, 195, 208 (1933).

(820) Heiss, R., "Experiments on the Refrigeration Requirements and the Amounts of Frozen-out Water with Fast and with Slow Freezing of Foodstuffs." Z. Ges. Kalte. Ind. 40, 97-104, 122-8, 144-6 (1933).
C. A. 27, 5829 (1933).

(821) Heiss, R., "Contribution to the Theory of Changes in Food Caused by Freezing." Ziet Fuer Die Gesamte Kaelte-Industrie 47, No. 8, 155-6 (1935). Contribution of theory of changes in food products caused by freezing. Abstract of paper before Deustche Bunsengesellschaft.
E. I. 1936, 953.

(822) Heiss, R., "The Freezing of Foodstuffs." Angew. Chem. 49, 17-21 (1936). - A math. evaluation of the most favorable freezing conditions is presented. Freezing and cold storage experiments were carried out with meat and milk under varying conditions. Conclusions: (1) Meat: (a) Freezing is to take place as soon as possible after the kill, as the pH value influences freezing changes, and oxidative changes are accelerated by decreasing pH values. (b) Freezing is to be carried out as fast as possible; the freezing temperature should not be higher than -17° to -20°; the former view that the freezing changes become particularly great if freezing is carried below a certain temperature was found to be wrong and the critical interval was found to be between -4° and -9°. (c) If long storage periods are to be used, the storage temperature must not be higher than -17° to -20°, and in order to obtain as few freezing changes as possible it is necessary both to freeze fast at low temperatures and store at the lowest possible temperature. (2) Milk: In contrast to meat, the freezing changes play only a subordinate role compared with changes due to storage; the temperature interval of -10° to -12° is to be avoided and storage is to take place in air and vapor-tight containers after preliminary removal of the dissolved O_2. Experimental data and nine references are given.
C. A. 30, 1875 (1936).

(823) Heiss, R. and Peach, K., "Comparative Experiments on the Freezing of Fruits and Vegetables." Z. Ges. Kalte-Ind. 44, 188-94, 212-17 (1937). - Freezing and storage at -9° and at -24° were compared. When the goods are to be kept 6 months a temperature of -24° is necessary to preserve quality; for shorter periods (3 months) -9° is sufficient in most cases. The lower temperature is especially effective in preserving vitamin A.
C. A. 32, 2239 (1938).

(824) Heiss, R., "Preliminary Results of Freezing Fruits and Vegetables in Germany." Angew Chem 52, No. 29, 490 (1939). - The freezing of various varieties of fruits and vegetables differs. The preserving of vitamin C and salts is particularly noteworthy.
B. A. 15, 2241 (1941).

(825) Heiss, R., "Freezing Preservation of Fruit and Vegetables in Germany." VDI Zeit 83, No. 47, 1229-35 (1939). - Cold storage of fruit and

vegetables in Germany, importance of present status of development; progress made in research in field which is intermediary between mechanical engineering and biology; organization of cold storage supply system.

E. I. 1939, 259.

(826) Heiss, R., "The Cryovac Process." Zeit Fuer Die Gesamte Kaelte Inustrie 46, No. 5, 95-6 (1939). - Cryovac process for freezing of foodstuffs, especially meat and poultry, by packing in waterproof bag or sack of latex; brief description of method employed by firm of Dewey & Almey, Cambridge, Mass., advantages of process.

E. I. 1939, 1006.

(827) Heiss, R., "New Discoveries and Possibilities in the Field of Food Freezing." Angew. Chem. 53, No. 13/14, 148 (1940). - The greater importance of enzyme reactions in comparison with the form of ice crystals in determining the quality of frozen foods is emphasized.

B. A. 16, 695 (1942).

(828) Heiss, R., "Freezing of Fruits and Vegetables." Angew. Chem. 53, No 13/14, 149 (1940). - Fruits and vegetables prepared as in canning were kept one year at -18°C. Very little loss of vitamin C was found.

B. A. 16, 728 (1942).

(829) Heiss, R., "Freezing of Fruit and Vegetables." Zeit Fuer Die Gesamte Kaelte-Industrie 47, No. 4, 58-62 (1940). - Refrigeration of fruit and vegetables; notes on degrees of ripeness and grading; pretreatment, packing, freezing, storage, transportation, etc. Bibliography.

E. I. 1941, 1026.

(830) Heiss, R., "New Information About the Freezing of Foodstuffs." Z. Ver. Deut. Ing. 84, 213-17 (1940). - A review and discussion of frozen foodstuffs. 26 references.

C. A. 34, 6371 (1940).

(831) Heiss, R., "Investigations of Technical Methods for the Improvement of Fruit and Vegetable Preservation." Ernahrung 7, No. 9, 241-7 (1942). The duration of heating required to inactivate the enzymes in apples, asparagus, potatoes, peas, beans, kohlrabi, and spinach differs and depends on size and shape of particles. When the enzymes of asparagus and kohlrabi were destroyed by heating in water, there was considerable loss of dry matter and vitamin C. Steaming produced considerably less loss of dry matter but only slightly better preservation of vitamin C.

B. A. 19, 2017 (1945).

(832) Heiss, R., "Improving the Quality of Preserved (Frozen) Vegetables and Fruit Products." Z. Ges Kaelte-Ind. 49, 131-6, 142-5 (1942). - Only a few varieties of vegetables are improved by extremely rapid freezing. The decrease of the aroma and the appearance of a by-taste are not prevented by increased freezing rate. For fruits and berries that absorb sugar strongly the rate of freezing need only be great enough to prevent fermentation; this depends chiefly on the sugar concentration. The lower limit of the freezing velocity is approximately 2.5-3 millimeters per hour. How-

ever, biochemical and histological differences in fruits and vegetables make a strict generalization impossible In some cases rapid freezing was less favorable than normal freezing for the retention of vitamin C. Keeping at room temperature was unfavorable for the ascorbic acid content.

C. A. 38, 4053 (1944).
C. Z. I, 1428 (1943).

(833) Heiss, R., "The Development of Quick Freezing of Foods in Light of Patent Literature." Kaelte-Industrie 49, No. 7, 82-6; No. 8, 96-100 (1942). Development of quick freezing process for foodstuffs in light of patent literature; over 200 patents referred to; it is believed this review gives for the first time fairly complete coverage of patent literature of Germany and United States for past 30 years.

E. I. 1944, 889.

(834) Heitz, T.W. and Swenson, T.L., "Quick Freezing of Dressed Poultry." Ice & Refrig. 85, No. 4, 163-5 (1933). - Report of preliminary experiments made by U. S. Department of Agriculture on quick freezing as compared to slow freezing of dressed poultry; fog system used; experiments made with Long Island ducks and on other frozen poultry. Also in: U. S. Egg and Poultry Mag. 39, No. 11, 36-7 (1933).

E. I. 1933, 959.

(835) Heitz, T.W. Grading Dressed Turkey. U. S. Department of Agriculture, Farmers' Bulletin 1815, 1938.

(836) Heitz, T.W. Evisceration and Quick Freezing of Poultry in the U. S. Proceedings Seventh World's Poultry Congress, 1939. pp. 368-370.

(837) Heitz, T.W. Dressing & Packing Turkeys for Market. U. S. Department of Agriculture, Farmers' Bulletin 1694, Revised, 1940.

(838) Heitz, T.W. The Cold Storage of Eggs and Poultry. U. S. Department of Agriculture, Circular 73 Revised, 1940.

(839) Hemmeter, G.T., "New Development in Technique of Blanching." Food Indust. 15, 137-8 (1943). - Describes the method of forcing steam to pass through a bed of the cut materials to be blanched. The rate of heat transfer can be substantially increased, and entrapped air driven out positively, so that blanching may be done successfully in a very thick bed with no evidence of damage or mashing of the bottom layer because of the weight of materials above it. This method would greatly reduce damage of material and space needed for the blanching process.

E. M. F.

(840) Henderson, E. W. Freezer Burning of Poultry Prevented by Water. Mich. Agr. Expt. Sta. Quart Bull. No. 24, 1942. pp. 304-7. - Freezer "burn" is a serious defect in frozen poultry and results largely from dehydration. Correct wrapping is of marked aid in preventing freezer burn. Glazing the meat with a thin layer of ice is also helpful. This coating

must be renewed after a few months in freezing storage.
C. A. 36, 6688 (1942).

(841) Hening, J.C. and Dahlberg, A.C. Frozen Fruits for Ice Cream. New York State Agriculture Experiment Station, Bulletin 634, 1933.

(842) Hess, H.E., "Quick Frozen Foods - Fish." Vet. Bull. 35, No. 2, 73-85 (1941). - The methods and principles of quick freezing and sharp freezing are compared. The physical changes in tissue frozen by the two methods are described. There is given a detailed description of the handling of fish and the equipment used from the time it is caught until it reaches the consumer. It is stated that fast-frozen products are superior to sharp-frozen ones and that frozen products must be handled before freezing to insure a minimum of bacterial contamination, bruising and spoilage.
B. A. 15, 2241 (1941).

(843) Hickman, E., "Quick Freezing Texas Shrimp." Refrig. Eng. 43, 212 (1942). - Quick freezing shrimp as applied by the Colter Corporation at Palacios, Texas.
W. B. C.

(844) Hilder, "A Locker Plant Operator Advises His Patrons." Quick Frozen Foods 7, No. 9, 83, 94 (1945).

(845) Hills, C.H., White, J. W., Jr., and Baker, G. L., "Low-Sugar Jellying Pectinates." Proc. Inst. Food Tech 1942, 47-58. - Cf. C. A. 36, 6259. The formation of a stable gell with ordinary pectin requires the use of approximately 65% sugar plus a small amount of acid. Pectinate gels require neither sugar nor acid, but gelatin is brought about by the addition of Calcium or other multivalent cations. Sugar and acid may be incorporated into the gel formula to improve the flavor, without materially affecting the properties of the gel. Thus the quantity of sugar used in making fruit gels with pectinates may be much less than 65% and still produce a very satisfactory product. Pectinates can be produced in 2 ways: (1) acid demethylation, and (2) enzyme-demethylation. The former consists in treating the pectic material with strong acid at temperatures of 50° C. or below for 1 or 2 days. The key to successful demethylation lies in the selection of conditions of acidity, temperature and time which cause the minute degradation of the polygalacturonide chain. Acid-demethylation can be applied at various stages in the usual processes of pectin manufacture, i.e., the fruit pomace, the pectin extract or the precipitated pectin itself. The enzyme method utilizes petase enzyme, a convenient source of which is raw tomato juice. The best stage at which to demethylate pectin with enzyme is immediately after the pectin extract has been filtered. In order to realize the full activity of the enzyme it is necessary to add oxalic acid in the amount equal to 0.1% of the weight of the extract. It is further necessary to adjust the pH value of the extract to about 6.0 and maintain it at this level throughout the reaction. Approximately 1 quart of tomato juice (filtered) is sufficient to demethylate 50 gallons of 0.6% pectin extract in 1 hr. at 50°C. Practical applications of the use of these pectinate gels are pointed out. The addition of a small quantity of Ca pectinate to a sugar syrup greatly increases the viscosity of the product. Low-ester pectinates offer means of preparing processed fruit and vegetable salads and fruit desserts. They can be used in acid products where gelatin would break down. They have not been

successfully used to improve the moisture retention of cream cheese owing to the sensitivity of pectinates to the Ca in the cheese whey. They are of particular advantage in preventing leakage in frozen fruits such as strawberries and raspberries Pectinates can likewise be used in pharmaceutical preparations where a trace of Ca is not objectionable. Another possibility is in the preparation of new nutrient bacteriol culture media. Cf. C. A. 35, 3730.

C. A. 37, 966 (1943).

(846) Hiner, R.L. and Hankins, O.G., "Tenderness of Beef as Affected by Aging With and Without Subsequent Freezing." Refrig Eng. 42, No. 3, 172-4 (1941). - Objects of study reported were to determine effect on tenderness of beef of aging for various periods up to 33 days and freezing at different temperatures after aging for various periods. Bibliography.

E. I. 1941, 473.

(847) Hiner, R.L. and Kauffman, W.R., "Coating of Fat Protects Meat Against Freezer Burn." Fruit Indust. 16, No. 4, 275-8, 328 (1944). - After dipping in melted lard (100°-200°F.) frozen meat may be stored at 0°F. for 64 weeks without objectionable loss of weight; the fat coating may be protected from scratching by wrapping in oiled paper.

B. A. 18, 2019 (1944).

(848) Hiner, T., Madsen, T.T. and Hankins, O.R., "Histological Characteristics, Tenderness, and Drip Losses of Beef in Relation to Temperature of Freezing." Food Research 10, 312-24 (1945). - Longissimus dorsi beef muscle frozen at 18°F resulted in the formation of large interfibrillar ice areas. No intrafibrillar ice crystals or areas were observed. Size of ice crystals and of ice areas between fibers decreased as freezing temperatures were lowered. Intrafibrillar freezing and some fiber wall damage were visable at 0°F and they became more extensive as the temperature was further lowered. At the lowest temperature (-114°F.) the fibers were even split longitudinally into several sections. Moreover, intrafibrillar ice crystals were very extensive and small as the freezing temperature was lowered, tenderness increased and precipitated proteins and nuclear fragments outside the fibers became more extensive; at the same time drip during subsequent thawing decreased. Increased intrafibrillar freezing and rupturing of fibers permitting the proteins to reabsorb a large portion of the water originally frozen in the meat were believed to be the cause of the decrease in the amount of drip These results were based on examination 24 to 36 hours after freezing.

C. A. 39, 5349 (1945).

(849) Henman, R.B., Schutt, C. D. and Holley, H.A. Curing Meats. Cornell Agriculture Experiment Station, Extension Bulletin 241, 1940.

(850) Hoey, J.J., "Locker Plant Builds Market for Surplus Fruits and Seafoods." Ice & Refrig. 102, No. 2, 127-9 (1942). - Story of Sebastopol, California cold storage plant, how it was developed and enlarged since 1936; locker plant described is 90 sq. ft. with platform for preparatory freezing operations; three compressors providing refrigeration have 12 and 16 tons capacity respectively; freezing operation is by cold blast method at 20°F.; individual locker room is 22 x 52 x 10 ft., three bulk freezing

rooms are 16 x 24 x 10 ft.

E. I. 1942, 237.

(851) Hoey, J.J., "Food Freezing Research, I, II." Ice & Refrig. 106, No. 2, 99-102; No. 3, 157-9 (1944). - What is being done at Western Regional Research Laboratory, Albany, Calif., to find answers to problems created in rapidly growing food processing industries; discussion of methods used and results schieved from program of research planned to attain practical results; principles developed from this research are being used successfully by commercial food packers and canners.

W. B. C.

(852) Hoffman, K.L. Palatability Studies on Poultry. Master's Thesis, Iowa State College, Ames, Iowa, 1939. - I. Chilling prior to freezing, plus variation of the length of storage after freezing before drawing. II. Washing versus wiping the body cavity after drawing.

(853) Hohl, L.A. and Smith, M., "Comparison of Vitamin C. Content and Palatability of Frozen, Canned and Dehydrated Vegetable Purees." Fruit Products J. 24, 54-6, 62 (1944). - Purees prepared from asparagus tips, asparagus butts, carrots, peas, peas and pods, and spinach were preserved experimentally by canning, freezing, and dehydrating, and their general appearance, palatability, and H_2O-solution vitamin contents were compared initially and after storage. Under the experimental conditions, the frozen product was the best; the canned was also quite acceptable. The dehydrated powders were good but tended to deteriorate more quickly during storage unless they were packed in vacuum.

C. A. 39, 2157 (1945).

(854) Hohl, L.A., "Experiments Prove Value of Freezing Baby Foods." Quick Frozen Foods 6, No. 13, 30, 36 (1944). - Suitable purees of fruits and precooked vegetables are prepared for freezing with a press or disintegrator with a 0.04 inch sieve or screen. Steam blanching of fruits prevents enzymatic darkening and flavor-deterioration during storage; addition of 12-20% sucrose is desirable and blending offers possibilities. Color and flavor of vegetables are well retained for 12 months or more, vitamin B_1 retention was 53% in spinach puree stored 12 months, 93% B_1 in asparagus stored 4 months, and 92% of vitamin C in asparagus stored 6 months. The losses probably occurred largely in preparation before freezing.

B. A. 19, 47 (1945).

(855) Hohl, L.A., "Sulfur Vs. Steam Blanching of Fruits." Quick Frozen Foods 7, No. 6, 38, 39 (1945). - Discoloration and other oxidative changes in frozen fruit may be prevented by heat treatment, exclusion of air, and chemical treatment. Heat treatment may be steam, hot water or 15-25% hot sugar solution. Some leaching occurs. To exclude air, sugar solution is used as packing liquor, but as the enzymes remain intact, prompt use after defrosting is imperative. The most popular chemical is SO_2; liquid SO_2 is the cheapest and most convenient form, but excess dosage must be avoided. Other antioxidants of possible value are ascorbic acid and thiocarbamide.

B. A. 19, 1113 (1945).

(856) Hohl, L.A., "Constant Experimentation Results in New Products." Quick Frozen Foods 7, No. 11, 52-3, 73 (1945). - A general discussion on quick freezing research. A growing tendency toward precooking instead of simply blanching is noted; critical evaluation is needed. New frozen food products are discussed.

B. H. W.

(857) Hohl, L.A., "Untreated Natural Pineapple Freezes Best." Quick Frozen Foods 8, 93-5 (1945). - Summary. Frozen pineapple tidbits kept their original flavor when stored for a year at 0-10°F. Sulfiting or blanching had no beneficial effects. Fruit frozen without sugar was better in flavor than that frozen with either dry sugar or 35° Brix cane sugar. Unpublished data taken by Dr Joslyn of this laboratory several years ago indicated that the frozen juice keeps well.

B. J. W.

(858) Holley, K.T., "Some Technical Problems of the Frozen Food Industry." Refrigerating Eng. 23, 58 (1932). - Lack of knowledge as to what chemical changes take place when fruits and vegetables are subjected to various methods of preservation is pointed out. The difficulties involved in obtaining such knowledge are also discussed.

C. A. 26, 1039 (1933).

(860) Holske, C.F., "Frozen Brine." Refrig. World 66, 13-15 (1931).

(861) Hopkins and Swain, "Characteristics Desirable In Peas, Beans and Corn for Canning and Freezing." Western Canner & Packer 31, No. 2, 13-16, 22 (1939).

(862) Horne, G.A., "Aging & Tendering of Meat." Refrig. Eng. 33, No. 4, 236-7 (1937). - Review of developments in aging and tendering - most of which is work done in field of above freezing temperatures. Value of quick freezing in terderizing meat is pointed out and discussed.

F. F.

(863) Hosier, R., "Fresh Frozen Fruits & Vegetables." Ice & Refrig. 92, No 1, 55-6 (1937). - Advantages of frozen fruits and vegetables over other types of foods; comparison of costs with canned products; proper methods of handling.

E. I. 1937, 980.

(864) Hoskins, J.K., "Most Probable Numbers for Evaluation of Coli-Aerogenes Tests by Fermentation Tube Method." Public Health Repts., U. S. P. H. Serv. 49, No. 12, 393-405 (1934). - See: J. Am. Water Works Assoc. 25, 867-877 (June, 1933).

(865) Hosmer, J.B., Woodroof, J.G., Warren, N., Mason, J.W., Firor, J.W., Keener, R.L. and Davis, M.C. "Food Preservation Prospectus." Ga. Sch. Tech. Eng. Expt. Sta., Bull. 3, No. 6, 95 (1941). - Various types of food preservation are briefly considered, and quick freezing and canning are worked out in detail, showing advantage and disadvantage with respect to economic

factors of market, plant operation, raw materials, necessary capital, and specific plant locations; study is paralled by detailed examination of technological and processing problems.

E. I. 1942, 430.

(866) Howard, L.B. and Campbell, H., "Dehydrofreezing - New Way of Preserving Foods" Food Industries 18, No. 5, 88-90 (1946). - Dehydrofreezing process combines dehydration and freezing preservation of foods. Removal of about two-thirds of the water content is followed by freezing storage. This results in retention of fresh-quality, and at the same time is economically important from the standpoint of packaging and storage costs. Weight and volume are less than with conventional freezing.

F. F.

(866A) Howard, L B. Report on Investigation (of Gronland G.m.b.H., Grevenbroich) for the Food and Agriculture T.I.I.C. Subcommittee. Office of the Publication Board (Washington) Report No. 1725, September 10, 1945. 2 pages. - A description of this German plant which was engaged in the manufacture of frozen fruit pulps, marmalades, and frozen vegetables. It was originally an ice cream plant, and its freezing equipment was limited. Freezing was largely effected by thermal contact between aluminum trays and coils maintained at -42°C., resulting in a freezing time of $1\frac{1}{2}$ to 2 hours. Asparagus, apples and whole berries have been frozen; frozen compotes of berry fragments and apples have been prepared. Freezing and storage equipment is described, and details of preparation (and blanching, where needed) are given.

B. H. W.

(867) Hucker, Pederson and Brooks. Sanitation of Food Plants. New York State Agriculture Experiment Station, Geneva, 63rd Annual Report, 1945.

(868) Hucker, G.J., "Food Packaging - Requirements Studied for Frozen and Dehydrated Foods." Sci. Am. 172, 49-50 (1945). - From communication or speech - Dr. Hucker quoted: Preliminary results of a comparative nature given for packaging frozen foods. Tests completed and results given for packaging of dehydrated foods.

F.F.

(869) Humphrey, H.J., "Freezing Makes Rapid Progress." Food Industries 8, No. 12, 612-3 (1936). - Quick vs. slow freezing; quick freezing methods; varieties adapted to freezing; enzymes, bacterial growth; quality; other problems. Bibliography.

E. I. 1939, 980.

(870) Hunter, A.C., "Uses & Limitations of the Coliform Group in Sanitary Control of Food Production." Food Research 4, 531-8 (1939). - Editorial Review points out the practical uses and limitations of bacteriological tests for the presence of coliform organisms as an index to sanitary methods of handling. Interpretation of positive findings must be made within limitations imposed by source of food. The coliform organisms, it must be remembered, are not the only group which can be used as an index of pollution, and this group can be used only within prescribed limitations.

F. F.

(871) Huntsman, A.G., "Ice Fillets." Can. Fisherman 16, 17-18 (1929).

(872) Huntsman, A.G. The Processing and Handling of Frozen Fish as Exemplified by Ice Fillets. Biology Board of Canada, Bulletin 20, 1931.

(873) Hustralid, A. and Winter, J.D., "The Effect of Fluctuating Storage Temperatures on Frozen Fruits and Vegetables." Agric. Eng. 24, No. 12, 416 (1943). - As long as they did not go above 50°F., fluctuating temperatures during 6 to 9 months were as effective as constant temperatures in preserving quality. A one-compartment freezer may serve as storage compartment even though temperatures must be lowered when additions are made to the locker.

B. A. 18, 1117 (1944).

(874) Hutchins, T.S., "Dept. of Commerce Sizes Up Frozen Foods." Quick Frozen Foods 8, No 5, 78-79 (1945). - History and rapid growth of the frozen foods industry; production increases during the war would have been greater had it not been for restrictions on freezing equipment, cabinets and home refrigerators, together with other wartime restrictions. Qualifications for entering frozen foods processing business: Capital; access to technical knowledge; access to fresh produce; low cost labor; supply of good water; railroad facilities and effective market outlets. Most opportunities in frozen food production will benefit those who are already acquainted with this or related fields. Predicts greater opportunity in allied branches of the industry. Gives official Dept of Commerce views on the future of the frozen foods industry.

B. J. W.

(875) Hyslop. G.T., "Quality Control in the Frozen Food Industry." Ice & Refrig. 98, No 4, 325-6 (1940). - Notes on plant sanitation; bacteriology; mold in fruits; mold in freezing tunnels; weights and mixing. Before Frozen Food Packer's School, Corvallis, Ore.

E. I. 1940, 1023.

(876) Isnova, N. N. The Problem of Vitamins. Inst. of Appl. Bot., Genet., and Plant Breed. Bulletin Suppl. 67, 1934. Pages 1-260. - Institute of Plant Industry has begun a study of the distribution of vitamins in culivated plants, the influence of external and geographic factors, the amounts found at various stages of development, and the possibility of enrichment of sources by breeding. In a nine page English summary the achievements of the last two years are given. These include studies of vitamin C content of various fruits, berries, and vegetables, the effect of various methods of treatment and preservation including freezing, and a critical discussion of chemical and biological methods of testing and interpretation of results.

B. A. 11, 610 (1937).

(877) Ihuzi, Y., "Vitamin C Content of Radishes at Low Temperatures." Hukuoka Acta Med. 33, 2 (1940). - Cf. C. A. 35, 5586. The juice and solid matter of grated radishes, which had been squeezed through a cloth, were allowed to stand at room temperature, and in various compartments of an electric refrigerator. The lower the temperature, the slower the reduction in vitamin C content of the juice. The vitamin C in the solid disappeared quickly except when frozen. The vitamin C in the juice can be concentrated by freezing.

C. A. 35, 6344 (1941).

(878) Ireland, R., "Frozen Foods." Canning Age 11, 397 (1930).

(879) Ireland, R., "Cold Packed Barreled Fruit in 1930." Food Indust. 3, 214 (1931). - Freezing of berries in barrels with two or three parts of berries to one part sugar with rolling of barrel every two hours is discussed. This method is carried out at temperatures sufficiently low to cool all fruit in barrel to 18° F. in 48 to 54 hours. Offers advantage by reducing time required to remove heat from berries, maintains qualities of color, flavor, and texture. Has disadvantage of being expensive.

F. F.

(880) Ireland, R., "Freezing and Shipping of Cold Pack Strawberries Sugared in Barrels." Ice & Refrig. 100, No. 3, 239-40 (1941). - New methods of handling, freezing and shipping cold pack strawberries, developed during recent years are discussed; one of most important improvements has been secured by thoroughly mixing sugar syrup with strawberries; this mixing is done by rolling barrels every few hours while berries are in process of freezing. Before Assn. Refrigerated Warehouses Convention, Feb. 19-24, 1941.

E. I. 1941, 1026.

(881) Irwin, J. C., "Chemistry in Food Freezing-Storage." Refrigerating Eng. 21, 348-9 (1931). - Recent chemical, physical, and biological investigations on frozen and stored foods are discussed.

C. A. 25, 3092 (1931).

(882) Irwin, J. C., Jr., "Factors in Commercial Cold Storage." Ind. Eng. Chem. 24, 674-5 (1932). - For humidity determinations at or near 0° the sling psychrometer is not an entirely satisfactory instrument. The direct absorption of water vapor with phosphorous pentoxide must be used for reasonably good accuracy. Ozonation has become a standard practice for the cold storage of some commodities, particularly eggs. Ozone reduces mold growth and the possibility of off-flavors. Abnormally high concentrations of carbon dioxide show promise in improving present cold-storage practices for some fruits and eggs. There is a distinct tendency in the industry to use lower temperatures than formerly along with controlled humidity.

C. A. 26, 4110 (1932).

(883) Isham, P. D. and Fellers, C. R. Effect of Manufacturing and Preserving Processes on the Vitamins of Cranberries. Massachusetts Agriculture Experiment Station, Bulletin 296, 1933.

(884) Ito, Y., Hukvoka Acta Med 33, 174-82, 10-11 (1940). - Fresh straight beans (soramame, Vicia faba L. F. ascendens, Makino) contain some reversibly oxidized vitamin C. Green (young) beans are richer in vitamin C than yellow (old) beans. Before freezing the beans were shelled and blanched in ordinary water, a 2% sodium chloride solution, a 1% sodium bicarbonate solution, and a solution containing 2% sodium chloride and 1% sodium bicarbonate at 85° C. to 95° C. for periods varying between 15 seconds and 5 minutes. They were then frozen quickly and stored at about -14° C. Their vitamin C content was determined after storage for 2 days, and for 3 months. The results suggest that on an average the loss of vitamin C is lowest when the blanching is carried out in ordinary water at 85° C. to 95° C. for 1 to 3 minutes. The vitamin C. content of the frozen beans, which had been melted in boiling water for 2 minutes, varied from 18.6 milligrams per 100 milligrams for beans blanched in a 2% sodium chloride solution for 3 minutes to 0 for beans blanched in a 1% sodium bicarbonate solution for 30 seconds; in both cases the beans had been frozen for 3 months.

C. A. 36, 579 (1942).

(885) Jacobs, M. B., The Chemistry and Technology of Foods and Food Products. New York: Interscience Publishers Inc., 1944. Vols. I & II.

(886) James, G. L. D., "The Efficiency of the Frozen Meat Industry." New Z. J. Sci. and Tech. 1, No. 6, 341-5 (1918). - Loss of dead weight in railing and droving, freezing, and transport.

E. I. 1919, 335.

(887) James, L. H., "The Microbiology of Frozen Foods." Ice and Cold Storage 36, 150-1, 173-4 (1933); Fruit Prod. J. and Am. Vinegar Ind. 12, No. 4, 110-3, & 114 (1932). - The type of the microorganism and the type of food material in which the microorganism is frozen determine the degree of survival. Fats and sugar solution have a protective action on the microorganism during freezing, while acid materials produce a greater killing.

C. A. 28, 1410 (1934).

(888) James, L. H., "Need for Uniform Practice in the Microbiological Examination of Food Products." Am J. Public Health 24, No. 4, 325-6 (1934).

(889) James, L. H., "Abstracts of Literature on Refrigeration." Refrig. Eng. 34, No. 4, 237, 244, 246, 248 (1937). - Biblio. of literature on preservation of foods.

E. I. 1937, 980.

(890) Jenkins, R. R., Tressler, D. K. and Fitzgerald, G. A., "Vitamin C Content of Vegetables. VIII Frozen Peas." Food Research 3, 133-40 (1938). - In the preparation for freezing, peas lost approximately thirty percent of their original content of ascorbic acid. The loss due to blanching alone was about ten per cent. The most rapid loss of ascorbic acid occurred during the cooling and washing operations subsequent to blanching. In steam blanching, little loss occurred after sixty seconds. Where a hot water blanch was used, the ascorbic acid loss increased with the blanching time. Minute loss occurred when the blanching period was just sufficient to inactivate ascorbic acid oxidase, and the peas were immediately cooled and frozen. When peas were held at -1° for 10 hours subsequent to packaging, no appreciable loss of ascorbic acid occurred. Thawing peas at room temperature for twenty-four hours in sealed moisture-proof packages resulted in no appreciable loss of ascorbic acid. Cf. Canner 85, No. 17, 13-14.

C. A. 32, 5950 (1938).

(891) Jenkins, R. R., Tressler, D. K. and Fitzgerald, G. A., "Vitamin C in Vegetables. Storage Temperatures for Frosted Vegetables." Ice and Cold Storage 41, 100-01 (1938); Proc. Brit. Assn. Refrig - General Conf. on Refrig. pp. 26-28 (1938). - Frozen peas, sweet corn, snap beans, Lima beans, spinach and broccoli were stored at temperatures of -40°, -18°, -12°, -9° and -7° and their vitamin C contents determined from time to time during storage for six to ten months. The experiments indicate the importance of low temperature for commercial preservation of frozen vegetables. In ord-

er to prevent loss in vitamin C content, the maximum storage temperature permissible is -18°. With snap beans and spinach a somewhat lower storage temperature should be employed.

C. A. 32, 7151 (1938).

(892) Jenkins, R. R. and Lee, F. A., "Tenderometer Readings As an Index of Quality of Fresh Asparagus." Food Research 5, 161-66 (1940). - For a given variety of fresh asparagus, the tenderometer was found to give a high correlation for tenderness and quality when compared with crude fiber and organoleptic tests. No definite limitations of tenderometer readings can be assigned as yet to the various commercial grades since these experiments present only preliminary data.

F. F.

(893) Jenkins, R. R., Tressler, D. K., Mayer, J. and McIntosh, J., "Storage of Frozen Vegetables. Vitamin C Content." Refrig. Eng. 39, 381-2 (1940). - Frozen vegetables were stored at different temperatures and their vitamin C content determined from time to time during storage for six to ten months. The experiments indicate the importance of maintaining low storage temperature of -18° C. or lower for commercial preservation of frozen vegetables. With Brussels sprouts and asparagus, a somewhat lower temperature should be employed.

C. A. 35, 5586 (1941).

(894) Jensen, L. B., "Action of Hardwood Smoke on Bacteria in Cured Meats." Food Research 8, 377-87 (1943). - General discussion of advantages of smoking meats; properties of wood smoke; bactericidal action of smoke because of chemicals therein and its power to penetrate; experimental data.

F. F.

(895) Jensen, L. B., "Prevention of Bacterial Food Poisoning by Food Preservation Methods." Jour. Bact. 45, No. 1, 60-61 (1943). - An abstract.

(896) Johnson, F. F. and Linder, M. J., Shrimp Industry of the South Atlantic and Gulf States. U. S. Bureau Fisheries, Report 21, 1934.

(897) Johnston, C. H., Schauer, L., Rappaport, S. and Devel, H. J., "The Effect of Cooking With and Without Sodium Bicarbonate on the Thiamine, Riboflavin and Ascorbic Acid Content of Peas." J. Nutrition 26, 227-39 (1943). - The addition of .22 gram of sodium bicarbonate to 180 ml of water in the cooking of 85 grams of fresh peas lowers the cooking time from 17 to 8 minutes and of frozen peas from 6 to 4 minutes. Approximately 80% of the thiamine, 65% of the riboflavin and 45 to 60% of the ascorbic acid were retained in the fresh peas after cooking with or without sodium bicarbonate. When the vitamin content remaining in the peas was added to that of the cooking water, the recovery of these three vitamins was practically complete. Similar results were obtained with respect to frozen peas as far as thiamine and riboflavin were concerned. The destruction of vitamin C, however, amounted to 15 to 20% with the frozen peas, and this was not influenced by the method of cooking. If the peas were over cooked the losses were considerably greater. Under these conditions the destructive effect of sodium bicarbonate was greater.

C. A. 37, 6757 (1943).

(898) Jones, A. H. and Lockhead, A. G., "A Study of Micrococci Surviving in Frozen Pack Vegetables and Their Enterotoxic Properties." Food Res. 4, No. 2, 203-16 (1939). - Of fifty strains of micrococci representing 930 cultures isolated from frozen pack vegetables, twelve strains were found to produce enterotoxic substances. Determinations were made by pipette-feeding method with filtrates of cultures grown on semi-solid starch medium in 25% carbon dioxide, using kittens as test animals. All positive strains fermented lactose and mannite. Strains of staphylococci from food poisoning outbreaks developed rapidly in vegetables at room temperature though at 40° C, no multiplication was observed. Of eighteen strains capable of elaborating enterotoxic substances in pure culture, eight strains were able to produce this in inoculated frozen corn defrosted at room temperature. None of the strains produced it in corn defrosted at 4° to 10° C.

B. A. 13, 997 (1939).

(899) Jones, J. B., Wood, M. A., Phillips, M. G., Fenton, F. and Harris, K. W., "Ascorbic Acid, Thiamine, and Riboflavin Retention in Quick Frozen Broccoli in Institution Food Service." Jour. Am. Diet. Assoc. 20, No. 6, 369-72 (1944). - Steamed quick-frozen broccoli retained over 80% of these three vitamins and 50-70% when cooked in enough water to cover, either by boiling of steaming. Drained cooked broccoli was held for fifteen minutes without vitamin losses; ascorbic acid was lost gradually thereafter. Reheating in water produced losses of all three and impaired palatability.

B. A. 19, 243 (1945).

(900) Jones, D., "Thermophilic Bacteria. Their Character and Significance in Relation to Foodstuffs." Food 7, 456-8 (1938). - A review which suggests soil as the source of thermophiles.

B. A. 15, 2244 (1941).

(901) Jones, D., "The Control of Meat Spoilage. II." Food (London) 11, No. 1, 25-27 (1942). - Canning is an unsatisfactory means of control because high temperatures cause changes in chemical constitution. Desiccation causes loss of color and flavor and does not prevent deterioration of fat. Chemical antiseptics usually do not have a lasting effect. Salt, sugar, vinegar and smoke are useful in retarding bacterial growth but their use is limited because flavor is the chief consideration. By far the most important means of preserving meat are chilling and freezing, the rapid freeze method being preferred.

B. A. 17, 1509 (1943).

(902) Jones, W., Phipps, H. and Snyder, R. N., Freezing Foods - Vegetables, Fruits, and Meats. Texas A. & M. Ext. Serv. Bulletin 130, 1943. 12 pages.

(903) Josephson, W. S. "Quick Freezing." Ice and Cold Storage 42, No. 491, 22 (1939). - Products to be frozen are exposed to an atmosphere of liquid and gaseous carbon dioxide. The occluded gases containing oxygen in the pores of the material are replaced with carbon dioxide. The moisture in the pores or on the surface of the frozen material is converted into dilute carbonic acid. Most of the bacteria and all spore-bearing bacteria that have been tested located on the surface of the product coming into contact with the carbon dioxide are killed and the spores rendered non-viable. Owing to the rapidity to which heat is extracted by the carbon dioxide used in freezing, there is an absence of ice crystal formation and there

is no destruction of cell tissues and the cells are intact. The protoplasm retains its gel structure and after thawing some of the tissue cells still live. There is no loss in vitamins from the foods as a result of freezing and storage.

C. A. 33, 5521 (1939).

(904) Joslyn, M. A. and Cruess, W. V., "Freezing Storage of Fruit and Vegetables for Retail Distribution in Paraffined Paper Containers." Fruit Products J. and Am. Vinegar Ind. 8, No. 7, 9-12 (1929); 8, No. 8, 9-12 (1929). - In general the packing of fruit in syrup was found superior to the dry pack and the sugar pack methods. The paper "bottle" was found to be an ideal container. The freezing method has been extended to the packing of vegetables, which, when blanched and packed in brine in paper "bottles" and stored at 0° - 15° F., are equal to fresh even after several months' storage.

C. A. 23, 3030 (1929).

(905) Joselyn, M. A. and Cruess, W. V., "Freezing Storage Suggestions." Fruit Prod. J. 8, No. 11, 12 (1929). - Packers of frozen foods should label retail packages in such a manner that the distributor and consumer are duly instructed in the care of the product and advised that such foods must be used promptly.

F. F.

(906) Joslyn, M. A., "Freezing Fruit in Small Containers." Fruit Products J. and Am. Vinegar Ind 9, 41-3, 57 (1929). - Ibid. 8, No. 7, 9 (1929); Ibid. 8, No. 8, 9 (1929).

(907) Joslyn, M. A., "Preservation of Fruits and Vegetables by Freezing Storage." Calif. Agri. Expt. Sta. Circ. 320, 35 (1930). - At temperatures of 10° F., molding, fermentation and bacterial spoilage do not occur and the normal ripening and respiration processes are effectively arrested. The commercial methods are outlined. Deteriorative changes due to oxidative enzymes go on slowly at freezing storage temperatures and cause surface discoloration in some fruits. The usual ratio of fruit to sugar is two or three to one. A syrup pack is preferred to a mixture of fruit and dry sugar, as surface discoloration is thus greatly reduced and better distribution of sugar is secured. After thawing, cold pack fruits keep from three to seven days without actual spoilage. Vacuum packing of fruit for freezing possesses the advantage that nearly all of the oxygen is excluded from the container, thus decreasing oxidative changes in the frozen product. Fruit juices may be frozen without much injury to their flavor. Though most vegetables may be successfully stored in the frozen state, slight changes in flavor and the inability to keep for more than a few hours after thawing render frozen vegetables less suitable for commercial exploitation than fruit.

C. A. 25, 1599 (1931).

(908) Joslyn, M. A., "Why Freeze Fruit in Syrup?" Food Ind. 2, 350-2 (1930). - Cf. Glass Packer 2, 115 (1929); Fruit Products J. Am. 8, No. 7, 9 (1929); Vinegar Ind. 8, No. 8, 9 (1929). - Advantages claimed for the syrup packed frozen fruits over the old dry sugar method are (1) air discoloration is reduced to a minimum; (2) syrup is more convenient than sugar, especially if the latter is to be uniformly distributed throughout the

mass of fruit; (3) there is less damage to the fruit during the addition of syrup than during the addition of sugar; (4) there is little or no change in fruit volume from loss of water from the fruit and no settling of the fruit in the container such as occurs in the sugar pack; (5) syrup is a better aid to preservation during freezing than sugar (it can be chilled before use and acts as a precooling agent); (6) the texture of the thawed fruit is better; (7) the syrup pack is applicable to all fruits, although the chief action of syrup lies in extracting juice from the fruit, the fruit actually absorbs some of the sugar. Drained weights for raspberries, strawberries, peaches and raspberries frozen with varying concentrations of syrup are tabulated.

C. A. 24, 5080 (1930).

(909) Joslyn, M. A., " Principles and Practice of Preserving Fruits and Fruit Products by Freezing." Ice & Refrig. 79, No. 3, 215-217 (1930); Fruit Prod. J. & Am Vinegar Indust. 9, 336-9 (1930). - Commonly used methods of food preservation; role of temperature, oxidation, and sugar; changes in texture on freezing; role of containers; behavior of fruits and fruit products on freezing.

E. I. 1930, 1500

(910) Joslyn, M. A. and Marsh, G. L., "Heat Transfer of Foods During Freezing and Subsequent Thawing. I Temperature Changes in Sugar Solutions." Ind. Eng. Chem. 22, 1192-7 (1930). - Determinations were made of the rate of temperature change in water, sugar solutions, pectin solutions and fruit juices in number 10 tin cans, during freezing at -17.8° C. and thawing at 21.1° C. The rate of change varied with the specific heat of the so lution, the heat conductivity, the freezing point, and the amount of ice formed. Heat transfer depended chiefly on conduction. With increasing sugar concentration, the initial rate of cooling was increased, the freezing point was lowered, the period of constant temperature was shortened and the rate of cooling of the frozen product was decreased. Viscosity had no appreciable affect.

C. A. 25, 362 (1931).

(911) Joslyn, M. A., "Frozen Foods and the Canning Industry." Canning Age 12, 676-7, 704-6 (1931).

(912) Joslyn, M. A., "Problem of Preserving Orange Juice By Freezing." Indus. & Eng. Chem. 24, No. 6, 665-8 (1932). - Complete solution of problem is not fully known as yet, and more detailed study of constituents of orange is necessary for this purpose. Bibliography. Before Am. Chem. Soc.

E. I. 1932, 1112.

(913) Joslyn, M. A. and Marsh, G. L., "Heat Transfer in Foods." Refrig. Eng. 24, No. 2, 81-8 (1932). - Temperature changes in fruit, vegetable, meat and fish products during freezing and thawing; tabular review of effect of refreezing berries upon rate of heat transfer; summary of rates of temperature changes.

E. I. 1932, 1111.

(914) Joslyn, M. A. and Marsh, G. L., "Temperature Changes in Small Food Containers in Fibreboard Cases." Refrig. Eng. 24, No. 4, 214-24 (1932). - Results of experimental study made at Fruit Products Laboratory, University of California; temperature changes in cans in cases; temperature changes in cans at various positions; air temperature in top and bottom tiers of cans during freezing and thawing; temperature changes in butter cartons; in birdseye cartons; in cases etc.

E. I. 1932, 554.

(915) Joslyn, M. A. and Marsh, G. L., "Observation on the Rate of Freezing on Texture of Certian Fruits and Vegetables." Fruit Prod. J. 11, 327-31 (1932). - With possible exception of asparagus, authors found that increasing rate of freezing with use of dry ice rather than air at 0° F., does not alter the texture of fruits and vegetables studied. The use of syrup for freezing fruit or brine for freezing vegetables markedly improves their texture. Variations may occur due to different conditions of the produce.

F. F.

(916) Joslyn, M. A. and Marsh, G. L., "Investigations on Temperature Changes in Food During Freezing and Subsequent Thawing." Fr. Prod J. and Am. Vin. Indust. 12, Nos. 1 & 2, 12-16, 44-48 (1932). - Rates of temperature changes in various foods under various conditions were determined during freezing and subsequent thawing, as criteria of the suitability of those conditions for preservation of the product. The temperature changes in sugar solutions, sweetened fruit juices and other liquids. in various berries packed with and without sugar or syrup, and in blanched and unblanched vegetables packed with and without brine, sealed in No. 10 cans during freezing at 0° and thawing at 70° F. Effects of type, size, and shape of the container, of initial temperature were determined and a study was made of temperature changes in small containers packed in various fiberboard cases. The chief factors determining rate of temperature change apparently were the specific heat and heat conductivity of the product, the temperature at which ice began to separate, the amount of ice that separated under freezing conditions, size and shape of the container, initial temperature of the product and shape of the container, initial temperature of the product and temperature and nature of refrigerant. Effect of neighboring cans in the case was more marked than that of types of cases studied.

B. A. 7, 1397 (1933).

(917) Joslyn, M. A. and Marsh, G. L., "Observation on Certain Changes Occuring During Freezing and Subsequent Thawing of Fruits and Vegetables." Fruit Prod. J. and Am. Vinegar Indust. 12, No. 3, 79-81 (1932). - Results of observations on changes in volume and wei ht during freezing storage and thawing are reported in this installment. The increase in volume of sugar solutions decreased from 8.6% for water to -1% for 70% sugar solution upon freezing at 0 to 5° F. The average increase in volume of whole raspberries and strawberries upon freezing was 4 and 3%; the crushed berries showed an increase of 6.3 and 8.2%, respectively. A decrease in weight of frozen fruit due to several factors which are discussed in a preliminary way was found during and after thawing. Data for loss in weight of various fruits frozen in plain water and cane sugar solutions, concentration from 10 to 70%, are given. No definite relation between concentration of syrup and loss in weight was found.

B. A. 8, 334 (1934).

(918) Joslyn, M. A. and Marsh, G. L. Changes Occurring During Freezing and Thawing of Fruits and Vegetables. California Agricultural Experiment Station Bulletin No. 551, 1933. 40 pages. - Of chemical changes induced, there was but little loss in pectin by hydrolysis by naturally occurring enzymes in berries, but a considerable inversion of sucrose was found. This was confirmed in investigations with pure invertase. Fruit exposed to air during freezing or during or after thawing darkened, discolored, and developed unnatural flavors when active oxidases were present. It was found impossible to inactivate the oxidases by heat without destroying the delicate fruit flavors, and permanent inhibition of the oxidase by means of acid or reducing agents such as sulphur dioxide affected the flavor of the fruit adversely to some extent. Oxidative changes in vegetables resulted in the development of unnatural haylike flavors. It was found that the development of these flavors could be inhibited and the flavor and color of the vegetable improved by blanching in steam or boiling water. Changes in flavor due to reactions other than oxidation also occurred on prolonged storage. The development of benzaldehyde flavor in peaches and cherries and of off flavors probably due to anaerobic respiration were expecially noticeable.

B. A. 10, 1378 (1936).

(919) Joslyn, M. A. and Marsh, G. L., "Observations on Certain Changes Occurring During Freezing and Subsequent Thawing of Fruits and Vegetables." Fruit Prod. J. and Am. Vinegar. Indust. 12, 203-5 & 220 (1933). - Further data on change in weight upon thawing of fruits and vegetables are reported. No direct relation was found between the loss in weight of fruit and ratio of fruit to sugar. The substitution of invert sugar or dextrose for cane sugar, either dry or as syrup, did not have the effect expected if osmotic pressure were largely involved in the phenomena. Variety of berry and of peach influenced the results. The change in weight of frozen vegetables upon thawing depends on the kind of vegetable and treatment prior to freezing. An increase in weight due to absorption of brine occurred in a number of cases. The loss in weight decreased as rate of freezing increased. No direct relation was found between loss in weight and change in texture of either fruit or vegetable.

B. A. 8, 49 (1934).

(920) Joslyn, M. A. and Marsh, G. L., "Certain Changes Occurring During Freezing and Subsequent Thawing of Fruits and Vegetables." Fruit Products Jour. 12, 236-9, 248 (1933). - A study of the changes in pectin and absorption of sugar by fruit.

C. A. 27, 3013 (1933).

(921) Joslyn, M. A. and Marsh, G. L., "Observation on Certain Changes Occurring during Freezing and Subsequent Thawing of Fruits and Vegetables." Fruit Products J. 12, 330-2 (1933). - Cf. Ibid. 12, 263 (1933). A study was made of the severity of sulphur dioxide treatment necessary to preserve the color of Gravenstein apples, Blenheim apricots and Elberta peaches which were frozen and subsequently thawed. Treatment for one minute in 500 p.p.m. sulphur dioxide solution was sufficient to preserve the color of peaches and apricots, but ten minutes was necessary for apples. Packing peaches in a sugar syrup containing 100 p.p.m. sulphur dioxide preserved color and flavor without adversely affecting the flavor; if more than this amount of sulphur dioxide was used, the preservative was detected by taste. Lye-peeled Phillips cling peaches were washed and frozen in 40%

sugar syrup with and without rinsing in either 2% citric acid or 2% hydrochloric acid. When no acid rinse was used, marked surface discoloration resulted. Rinsing in 2% hydrochloric acid resulted in too sour a flavor, while 2% citric acid did not check surface darkening. Rinsing lye-peeled Elberta peaches in 3% citric acid was satisfactory. No difference such as described by Woodroof (Woodroof, J. G., Ga. Expt. Sta. Bull. 163, 3, 1930.) for Elberta peaches was found between the two lye-peeling methods applied to Phillips clings. Peas blanched in either steam or water for a minute or longer gained weight during freezing in brine (2% sodium chloride) and subsequent thawing. Blanched samples were somewhat more tender than the unblanched. Peas, string beans, and asparagus blanched for 60 seconds in steam retained their flavor during storage for over a year. Changes in flavor owing to changes other than oxidation also occur in prolonged storage. The development of benzaldehyde flavor in peaches and cherries and off-flavors due to anaerobic respiration were noticeable.

C. A. 27, 4319 (1933).

(922) Joslyn, M. A. and Sherrill, M., "Inversion of Sucrose by Invertase at Low Temperatures - Preliminary Report." Ind. & Eng. Chem. 25, 416-7 (1933). - Inversion of sucrose was observed during investigations on chemical and physical changes occurring in fruits during freezing and thawing, and marked inversion of sucrose was noted in certain crushed fruits packed with sugar and stored for at least eight months at from -16° to -12° C. Studies were carried out which showed that inversion of sucrose by invertase occurs at temperatures of -16° to -12° C. There is some evidence that invertase is inactive at lower temperatures, about -40° C.

F. F.

(923) Joslyn, M. A. and Marsh, G. L., "Role of Peroxidase in the Deterioration of Frozen Fruits and Vegetables." Science 78, 174-5 (1933). - Preliminary report of data tending to show that peroxidase activity is not responsible for all of the undesirable change in certain materials preserved by freezing. In some cases blanching at a lower temperature than will inactivate the peroxidase is sufficient to preserve satisfactory flavor and color.

C. A. 27, 5436 (1933).

(924) Joslyn, M. A., "The Present Status of Methods for Improving the Quality of Frozen Fruits and Fruit Products." Fruit Prod. J. 13, 142-45, 153, 155 (1934). - Adapted largely from paper before Pacific States Warehousemen's Association, Feb. 1933. "Methods of treatment which improve the keeping qualities of the varieties of fruits and vegetables available for freezing": syrup pack, scalding or blanching of vegetables, deaeration, freezing and storage temperatures.

F. F.

(925) Joslyn, M. A. and Marsh, G. L., "Keeping Quality of Frozen Orange Juice." Indust. Eng. Chem. 26, No. 3, 295-9 (1934). - Study of factors that influence keeping quality of frozen orange juice stored over two years at 0° F. Bibliog.

E. I. 1934, 930.

(926) Joslyn, M. A., Marsh, G. L. and Morgan, A. F., "The Relation of Reducing Value and Extent of Browning to the Vitamin C Content of Orange Juice Exposed to Air." J. Biol. Chem. 105, 17-28 (1934). - From study and experimentation it was determined and summarized that: (1) losses of vitamin C accompany decrease in iodine-reducing and indophenol-reducing value of orange juice and occurs at about the same rate; the correlation of titer and antiscorbutic value is definitely better with Valencia than with navel orange juice. (2) The extent of browning parallels the extent of loss in vitamin C so that either the latter is involved in browning or it is destroyed simultaneously. (3) Navel orange juice has a higher concentration of reducing substances than Valencia orange juice and probably has more reducing material other than ascorbic acid. (4) The decrease in reducing value of orange juice which occurred during freezing storage was more marked in the partly oxidized juice. (5) There is little choice between the indophenol titration and the iodine titration in estimating the changes in vitamin C content during prolonged oxidation of orange juice. (6) The iodine titration is superior to the indophenol titration in practice as it is easier to carry out and can be more readily duplicated. E. M. G.

(928) Joslyn, M. A., "Treatments for Discoloration of Apricots in Freezing." Ice & Refrig. 90, 388 (1936). - Three practical treatments for preventing browning of apricots are suggested: forcing the fruit to use up the oxygen in the tissues by a process of forced respiration; replacement of the oxygen in tissues by a process of syrup impregnation and inhibition of the oxidizing enzymes in the tissue by sulfurous acid. The latter method using sulfur dioxide gas is preferred.

C. A. 30, 8417 (1936).

(929) Joslyn, M. A., Bedford, C. L. and Marsh, G. L., "Enzyme Activity in Frozen Vegetables - Artichoke Hearts." Ind. Eng. Chem. 30, 1068-73 (1938). - Artichoke hearts contained a heat-resistant oxidase, a weak catalase and the oxygenase of Ouclow, or an organic peroxide or a substance which forms such a peroxide by an autoxidation activated by the oxidase present. Tyrosinase was not found. Peroxidase was greater in the hearts and catalase and acetic acid greater in the outer brasts. Catalase and peroxidase were destroyed by blanching. Blanching in 1% citric acid for nine minutes was necessary to prevent darkening over night. Tissues blanched with citric acid solutions had the most desirable color and those treated seven minutes in 0.5% acid had the best flavor. Artichokes stored at -17° for eight months, when cooked for twenty minutes, showed that less than seven minutes blanching gave an underblanched, discolored, and off-flavored product, over-blanching, a flat flavor, 1.0% too tart, lactic acid a lack in artichoke flavor and sulfur dioxide an off flavor and color and soft texture. Vitamin C remained the same, regardless of time or kind of blanching and varied from 0.053 to 0.088 micrograms ascorbic acid per gram. Ascorbic acid oxidase was destroyed by seven to nine minute blanching.

C. A. 32, 9318 (1938).

(930) Joslyn, M. A., "Certain Technological Aspects of Preservation Freezing." Quick Frozen Foods 1, No. 2, 10-13, 53 (1938).

(931) Joslyn, M. A. and Marsh, G. L., "Experiments Conducted on Blanching Action of Vegetables." Western Canner & Packer 30, No. 5, 21-22; No. 7, 35-7; No. 8, 37-40 (1938).

(932) Joslyn, M. A. and Bedford, C. L., "Enzyme Activity in Frozen Vegetables; Asparagus." Ind. Eng. Chem. 32, 702-6 (1940). - Ibid. 3, 751 (1939). Flavor retention in frozen asparagus is related to the inactivation of peroxidase catalyzing oxidation by hydrogen peroxide and gum guiacum. This does not parallel peroxidase activity determined in terms of pyrogallol oxidation or benzidene, or ascorbic acid oxidase activity. Scalding in water at 92° for four minutes or at 100° for three minutes is suggested. C. A. 34, 4175 (1940).

(933) Joslyn, M. A., "Factors Influencing the Keeping Quality of Frozen Foods." Ice. & Refrig. 99, 63-5 (1940). - Changes in the colloidal nature of frozen foods are discussed particularly in relation to bound water and irreversible changes in gel properties. Mineral salts organic acids and sugars may crystallize during freezing storage and may change composition or redissolve with difficulty; thus they affect the properties of the foods. Oxidation and enzymic changes also effect marked changes in properties of frozen foods.

C. A. 35, 220 (1941).

(934) Joslyn, M. A., "Fruits and Fruit Products. Color Retention in Fruit Products." Indust & Eng. 33, No. 3, 308-14 (1941). - A survey of present knowledge of the chemistry of color changes in natural plant pigments; non-oxidative discoloration, enzyme-catalyzed oxidative discoloration; non-enzymic and auto-catalytic oxidation; oxidation of citrus juices, role of ascorbic acid and of sulfur dioxide as well as other factors in the browning of juices. Sulfur dioxide is an excellent anti-oxidant, as is ascorbic acid. B. A. 15, 1739 (1941).

(935) Joslyn, M. A. and Kilner, S. B., "Effect of Rate and Extent of Freezing on Texture of Asparagus." Quick Frozen Foods 4, No. 12, 14-15, 35 (1942). - Texture of asparagus is poor after slow freezing; partly and completely quick-frozen asparagus showed no appreciable difference and 6 month's storage at -5° F. produced no change.

B. A. 17, 1398 (1943).

(936) Joslyn, M. A., "Preservation Freezing of Apricots for Subsequent Processing by Bakers, Baby-food Firms and Others." Western Canner and Packer 34, 45-50 (1942). - In order to prevent the darkening of the frozen fruit steam blanching, for not less than four minutes when exposed to a single layer, to destroy all oxidizing enzymes is recommended. It is then air-cooled, packaged and frozen. Water blanching is not satisfactory, for much of the soluble material is lost in the blanch water. Fruit for pies, jams, etc., can be prevented from discoloring by a four minute dip in a 0.4% solution of sulfur dioxide. A concentration of 40-50 parts per million of sulfur dioxide is necessary for color retention for two years at 0° F. in sealed cans. Thiourea has also been used successfully as a color retainer. A dip in a 0.1% solution for two minutes is used. Cf. Food Manuf. 18, No. 5, 151-55 (1943).

C. A. 37, 1792 (1943).

(937) Kable, G.W., "Some Development Trends in the Farm Freezing and Storing of Food." Agric. Engineer 22, No. 4, 143-6 (1941). - Not all of the farm-frozen products are as good as those which have been grown, harvested, and frozen under expert commercial supervision, but in most cases frozen farm products have been much more acceptable than the same products canned. Current practice in this type of food preservation and marketing is summarized.

B. A. 17, 250 (1943).

(938) Kaiukova, N.I., "Differentiation of Dead and Live Bacteria and the Method of Direct Counting in Their Application to Foodstuffs." Microbiol. U.S.S.R. 3, No. 1, 110-19 (1934). - The advantages of direct counting of microorganisms in comparison with the met od of Koch are considered. The Dreyer-Korolev method of direct counting was found most simple and most convenient The main disadvantage of the direct counting method is that dead as well as living cells are counted; differentiation was found possible if they were stained with a 0.2% solution of methylviolet, as only the dead cells take this stain The total number of microbic cells is determined by the Dreyer-Korolev method and the values obtained corrected after determining the percent of live and dead cells by the proposed staining method. After sterilization, bacterial cells do not lose their staining character.

B. A. 11, 431 (1937).

(939) Kalischer, M., "Humidity in Refrigeration." Refrig. Eng 38, (1939). Section 7 of Refrigerating Engineering Application Data. General discussion of temperature and humidity in relation to refrigeration. Table giving relation between Dry Bulb, Wet Bulb and Dew Point Temperatures and Relative Humidity included. W. B. C.

(940) Katkoff, "Survey and Statistics of the Quick-Frozen Pea Industry." Quick Frozen Foods 2, No. 11, 13, 38; No. 12, 19, 30-1 (1940).

✓(941) Kelley, J.R., "Frozen Shrimp." Ice & Refrig. 93, No. 4, 293-4 (1937). - Advantages of quick freezing over slow freezing methods; shrimp seasons; size of shrimp; type of containers; some advantages of frozen shrimp.

E. I. 1937, 980.

(942) Kelley, J.B. and Haak, P.J. Storing Food in Freezer Lockers. Kentucky Agric. Exp. Sta., Circ. 398, 1944. 16 pages.

B. A. 19, 47 (1945).

(943) Kellogg, M. and Pierson, E.M. Kind and Variety of Fruits and Vegetables Important in Freezing. S. Dakota Agric. Exp. Sta. Rept., 1941. 71 pages. - A progress report of work by M. Kellogg and E. M. Pierson with varieties adaptable to growing conditions in South Dakota.

B. A. 17, 858 (1943).

(944) Kellogg, M., "Freezer-Locker Storage of Fruits and Vegetables." Pro. S. D. Acad. Sci. 22, 80-82 (1942). - Quick freezing of foods as a means of preservation will not replace any other method, but supplements only. Not all foods are adapted to freezing, and not all varieties of the different foods are successfully frozen. Results of the first year's work on grading products indicated that with spinach, rhubarb, corn cut from the cob, and apricots, variety is most important; with snap-beans, green and wax, the length of time stored is the significant factor.

B. A. 8, 1572 (1944).

(945) Kertesz, Z.I. The Oxidase System of a Non-Browning Yellow Peach. N. Y. State Exp. Sta., Tech. Bull 219, 1933. 14 pages. - Slices and juice of Sunbeam peaches do not discolor when standing in air. This phenomenon is not due to the absence or low activity of oxidizing enzymes which have been found to be similar to those of other peach varieties. It has been shown by qualitative tests and quantitative estimations that the lack of catechol-tannins in Sunbeam peaches is responsible for the failure of the sliced fruit or the juice to darken.

B. A. 9, 1483 (1935).

(946) Kertesz, Z.I., "Inactivating the Respiration of Cannery Peas by Heat." Canner 96, No. 11, 7-8, 13 (1933). - Respiration was determined by the CO_2 produced during a two hour period at 27°. The inactivation of respiration of green peas (Surprise variety, size 3) by treatments with water at 80°, 90° and 100° was slow after 90% inactivation had been reached. An inactivation of 99.2% was reached in 2 minutes at 100°, while 8 minutes at 80° inactivated 94% only.

C. A. 27, 5438 (1933).

(947) Kertesz, Z.I., "The Browning of Yellow Peaches." Fruit Prod J. 13, 304-6 (1934). - Browning of peaches due to presence of catechol-tannins. See abstract No. 945.

F. F.

(948) Kertesz, Z.I., "The Quality of Canned Whole Kernel Corn." Canner 80, No. 11, 12-3 (1935). - Simplified method for determining alcohol-insoluble solids; percent of alcohol-insoluble solids in corn index to quality, with corn of inferior grade containing over 21%. These solids, however, should be used as only a part of the grading since other factors also influence the grade of corn. Determination procedure may also be used for peas.

F. F.

(949) Kertesz, Z.I., "Invertase Activity in Identical Mixtures in the Liquid and Frozen State." J. Am. Chem. Soc. 64, 2577-8 (1942). - Cf. Sizer and Josephson, C. A. 36, 5190 (1942). The velocity of invertase action in a frozen mixture at -6 8° C. was only 27% of that in a like mixture in the liquid state. The diminished availability of water may be responsible for this phenomenon. Data are given for reactivity in the liquid state at 20.2° C. and -6.8° C. and in the frozen state at -6.8° C. and -17.8° C.

C. A. 37, 394 (1943).

(949A) Kertesz, Z.I. Operation of the I. G Farbenindustrie Nitrous Oxide Food Freezer at Hochst. Final Report No. 399. Office of the Publication Board (Washington) Report No. 2039, October 25, 1945. 2 pages. - Reference is made to reports on this plant by G. MacKinney. Operations of one of the three freezing containers on spinach are described. After sorting, trimming, and repeatedly washing, the spinach was blanched, washed, placed in large bags (about 2 feet wide and 4 feet high) made of paper impregnated with a polyvinyl chloride resin (for flexibility, among other things); a bag made of "Opanol" (polyisobutylene) is also used, especially for fruits, but is much smaller (8 in. x 14 in. x 2 in.). After sealing, the bags are placed in perforated steel, box-like containers (2 feet square and 8 inches wide) which have handles on top. Fourteen of these holders are placed at one time into the freezing chamber of the machine, through which nitrous oxide is circulated at about -90°C. under 1 atmosphere pressure. Spinach freezing takes an hour; after freezing, the bags are stored at -11° to -16°C. Some I. G. employees claimed the preparation of high-quality frozen (whole) tomatoes; these are usually frozen without any wrapping. The author reports that the samples he saw were no better than those attempted in the United States. Nitrous oxide freezing is said to have marked advantages over air blast freezing if a long storage period must be employed. The author does not consider the products to be superior to those prepared "by good commercial practices" in the United States, but believes there may be economic advantages.

B. H. W.

(950) Khristodula, D A., "Preventing Decolorization of Brine Frozen Meat." Myasnaya Ind. U.S.S.R. 9, No. 5, 27-30 (1938). - Good results are obtained by adding 0.05 - 0.1 % $NaNO_2$ to the NaCl brine used for freezing. The original color of the meat is restored only progressively, from month to month, with 0.05% $NaNO_2$, it is optimum after 5 - 6 months and with 0.1% after 3 - 4 months. (Storage temperature being -8°C. to -10°C.). This regeneration of color is due to the formation at the surface of the meat of NO - hemoglobin, which is stable for up to 8 months. Cf. Chemie Indus. 40, 1093.

C. A. 33, 2602 (1939).

(951) Kiermeir, F. and Heiss. R., "Investigation of Conservation of Beef and Hog Adipose Tissues at Low Temperatures." Zeit Fuer Die Gesamte Kaelte-Industrie 46, No. 5, 91-5 (1939). - Investigation of conservation of beef and hog adipose tissues at low temperatures; observations after storage up to 18 months at temperatures of 8.5, 15, and 21°C. below zero, to determine degree of low temperature required for different periods of storage; effect of ventilation, etc. Cf. Ibid: No. 6, 111-8 (1939).

E. I. 1939, 260.

(952) Kinoshita, K., "On the Freezing of Gel." Bull. Chem Soc. of Japan 5, 261-6 (1930). - An apparatus is described in which solutions of gel were frozen. Cooling curves were obtained for solutions varying in concentration from 5 to 60% gelatin. Undercooling was pronounced and is attributed to inhibitive action of the gelatin on the formation of ice crystals. Alternate ice and gel layers were found in solutions of concentration up to 15% gelatin. Up to this concentration the freezing temperature fell less than 3 degrees. In the range of solutions between 15 and 30% the freezing temperature fell rapidly to -9.74°. It is concluded that there is almost no water is this region that can be separated by freezing. With still greater concentration of gelatin, water must be more firmly bound, since the freezing point is not depressed as rapidly. The freezing point-concentration curve is of an inverted S type.

C. A. 25, 1426 (1931).

(953) King, C.G. and Tressler, D.K., "Effect of Processing on the Vitamin C Content of Foods." Proc. 1st Food Conf. Inst. Food Tech 1, 123-32 (1940). - A general summary of information. Storage and dehydration are more or less destructive to vitamin C in foods. The blanching process for vegetables is more important to vitamin C retention than has been commonly recognized. Blanching, as a pretreatment for either freezing or canning, should be adequate to destroy oxidative enzymes while causing a minimum of loss of vitamins by diffusion from the product. When cooked, the vitamin C content of quick frozen and freshly cooked vegetables are about the same. In baking, frying and roasting, foods may lose 30-60% of their vitamin C content; steaming and boiling are slightly less destructive. A lack of careful attention to cooking losses may readily result in losses that range from 50-90%. The neutral type vegetables, such as spinach, asparagus, peas, green beans and kale undergo losses of about 40-60%. Fruits and their juices may be canned with losses of less than 20% of their vitamin C. Sauerkraut retains substantial amounts of vitamin C. When kraut is canned another 20% loss is sometimes obtained. 36 references.

C. A. 35, 2617 (1941).

(954) King, R.E., "Refrigeration in Retail Stores, Refrigerating Application Data." Refrig. Eng. 40, 1-6 (1940). - This paper discusses the principles upon which the refrigeration of perishable commodities must be based, and the application of these principles under commercial conditions. A review is given of recent work on the effect of cold storage and of shipment under refrigeration on the vitamin content of perishable commodities.

B. A. 15, 2060 (1941).

(955) Kiser, J.S. and Beckwith, T.D., "Effect of Fast Freezing Upon Bacterial Flora of Mackerel." Food Research 7, 255-9 (1942). - Micrococci were much more resistant to freezing temperatures than Achromobacter. Bacterial numbers were greatly reduced in the fish flesh frozen at -28°C. to -20°C. Freezing and storage at -20°C. for 15 days resulted in an approximate 100% decrease in suspensions of Achromobacter species used.

C. A. 36, 6255 (1942).

(956) Kisser, J., "The Use of the Freezing Method With Plant Material." Zeitschr. Wiss. Mikrosk. 45, No. 4, 433-441 (1928). - The freezing method of preparing sections of soft plant tissue is facilitated if the material is first put in gelatin or gum arabica.

B. A. 4, 310 (1930).

(957) Klaas, H. and Woodruff. S. How to Prepare Fruits & Vegetables for Frozen Storage. U. of Ill. Ext Service, Ext. Service Circ. 510, 1940. 20 pages. - General rules for success are given: enzyme action must be reduced, number of bacteria must be kept down. Choosing fruits and vegetables, discussed: ratings of fruits tested for freezing, ratings of vegetables tested for freezing. Choice of containers, packing fruits, packing vegetables, use of frozen fruits and vegetables, nutritive value of these, and freezer storage plants in Illinois are other topics discussed.

B. J. W.

(958) Knorr, M., "Review: The Significance of Physical Methods of Preservation for Food Hygiene." Jahreskurse Artzl. Fortbild 30, No. 10, 1-13 (1939). - A brief discussion of the use of cold, either alone or combined

with inert gases (CO_2 or N_2), dry ice, freezing, heat, desiccation and sterile filtration in the preservation of foods, and the effects of some of these methods on certain food components, or vitamins, minerals, proteins and enzymes.

C. A. 34, 1751 (1940).

(959) Knott, J.E., "Side Shoots Instead of Center Heads on Broccoli." Western Canner & Packer 38, 53-4 (1946). - Development of broccoli has been undertaken to increase side shoots and eliminate center head. Side shoots are better for freezing for they do not lend themselves to as much damage in handling, and they make a more attractive product since stems do not have to be split as is the case with the center head.

F. F.

(960) Knowles, Recipes for Cooking Frozen Foods and Directions for Freezing Fresh Foods Everett, Washington: Kane and Harcus Company, 1939.

(961) Knowles, "Better Quick Freezing." Western Frozen Foods 6, No. 5, 3-5 (1945).

(962) Knowles, D. The Preservation of Fruits and Vegetables in Cold Storage Lockers. N. D Agric. Exp. Sta., Circ. 169, 1940.

(963) Knowles, D. and Grottodden, O. Sharp Freezing of North Dakota Grown Vegetables and Fruits for Cold Storage Lockers. N. D. Sta. Bull., 1940. Vol. 2, No. 5, 10-13.

(964) Knowles, D., Grottodden, O., & Long, T.E. Freezing Vegetables. N. D. Ag. Exp. Sta., Bull. 322, 1943. 22 pages. - Comparative suitability of varieties of green beans, lima beans and wax beans, sweet corn and peas for freezing preservation.

E. B.

(965) Knowles, F.W., "Some Comments on Methods and Equipment for Freezing." Western Canner & Packer 31, No. 4, 105-6 (1939).

(966) Knowles, F.W., "How Foods are Frozen in the Northwest." Food Industries 12, Nos. 4, 5, 6, 54-6, 50-3, 59-61 (1940). - Article describes birth development and present operations of food freezing industry in the northwest; practical operating information, data and drawings on methods and equipment used are presented in form of case histories.

E. I. 1940, 1023.

(967) Knowles, F.W., "Freezing Foodstuffs Without Loss of Flavor." Ice & Refrig. 103, No. 1, 48-50 (1942). - Handling problems of quick freezing food plants; timing and how it affects quality of product; advantages of freezer shaker.

E. I. 1942, 922.

(968) Knowles, F.W., "Screw Conveyor Converted to Continuous Contact Freezer." Food Industries 17, 502-3 (1945). - A screw type continuous-freezing unit is described in which the cooling surfaces are the screw itself as well as the walls of the unit. Prefreezing the surface of the foods at 25°F prevented the formation of ice in the screw conveyor quick freezer which operated at -25°F. A screw-type freezer can be used as the prefreezer also.

C. A. 39, 4408 (1945).

(969) Koch, T.W., "Transparent Cellulose Bags for Packaging Quick Frozen Foods." Quick Frozen Foods 2, No. 7, 22-3 (1940).

(970) Kohman, E.F., "Freezing of Fruits and Vegetables." Ice & Refrig. 76, No. 2, 115-6 (1929); Canner 68, No. 10, part 2, 186. - Research findings are presented on freezing of fruits and vegetables and corrosion-resistant metals; freezing is oldest method of food preservation; prompt freezing necessary; chemical relation between sugars. Read before Nat. Canners Assn.

E. I. 2, 1575 (1929).

(971) Kohman, E.F. and Sanborn, N.H., "Effect of Respiration on Vegetable Flavor." Ind. & Eng. Chem. 26, 773-6 (1934). - Bruising of vegetables has marked effect on respiration. In this connection, raw frozen vegetables may be considered to be severely bruised since the cells are generally ruptured. An explanation is thus afforded for the off-flavors that develop. The manner in which the anaerobic activity is involved in the freezing, refrigeration, and handling of vegetables and fruits is discussed.

F. F.

(972) Kohman, E.F. and Sanborn, N.H., "New Blanching Procedure for Peas." Food Indust. 8, 112, 149 (1936). - The color of peas is discussed with reference to the cause of bright green color of peas after blanching. A new method of blanching peas in cans prior to canning is given; this method employs use of a steam exhauster. Paper presented before National Canners Ass'n, 1936.

F. F.

(973) Kohman, E.F., "Enzymes and the Storage of Perishables." Food Ind. 8, 287-8 (1936). - A general discussion of the role of enzymes in the storage, freezing and canning of fruits and vegetables.

C. A. 30, 6074 (1936).

(974) Kolbe, C.F., "Why Quick Freeze?" Food Industries 2, No. 4, 165-8 (1930). - Difference between slow and quick freezing; principal steps in development of quick freezing; freezing equipment depends on package chosen; refrigeration in distribution; frozen poultry.

E. I. 1930, 1500.

(975) Kolbe, C.F., "Packaging Quick Frozen Foods." Ice & Refrig. 79, No. 2, 122-125 (1930). - Radical changes brought about by development of process of quick-freezing perishable foods; packaging, storing and distributing problems, refrigeration requirements; shipping containers; loose pack-

age and block frozen package, sources of trouble arising during storage.
E. I. 1930, 748.

(976) Konz, P., "Low Temperature Systems." Section in Refrigerating Data Book, Fifth Edition. New York: American Society of Refrigerating Engineers, 1942. pp. 318-328. - Dry ice as a refrigerant is discussed; its many uses are described, among which are its use for preserving perishables and its use in the food packaging industry.
F. F.

(977) Koonz, C.H. and Ramsbottom, J.M., "A Method For Studying the Histological Structure of Frozen Products. I Poultry." Food Res. 4, No. 2, 117-28 (1939) - An inexpensive apparatus was described that adequately dehydrated frozen muscle tissue and simultaneously fixed such tissue by drying. The method described was similar in principle to the Altman-Gersh freezing-drying method. When the muscle tissue from frozen products was examined microscopically the previous location of ice formations was identified as intra-fiber or extra-fiber spaces. The condition of the ice crystals was described in chicken muscle frozen at -75.6°C.(-104°F.). When the muscle tissue was frozen rapidly, intra-fiber freezing occured. If the freezing process was sufficiently prolonged, there was a particular temperature at which water was lost by the muscle fibers and frozen external to the fibers. With respect to striated muscle tissue from frozen products, fast freezing was referred to as intra-fiber freezing, and slow freezing was referred to as extra-fiber freezing.
B. A. 13, 1084 (1939).

(978) Koonz, C.H. and Ramsbottom, J.M., "Susceptibility of Frozen-Defrosted Poultry Meat to Drip." Food Research 4, 485-92 (1939). - Similar cooking shrinkages were obtained from unfrozen and frozen birds (-13.3° to -45.5°). White meat showed greater drip on defrosting than dark meat. The pH values of the dark meat were normally higher than those for the white meat.
C. A. 34, 1762 (1940.

(979) Korschoff, J., "The Activity of Proteolytic Enzymes in Frozen Plants." Ber. Deut. Botan. Geo. 23, 3473-9 (1907).

(980) Kramer, A. and Mahoney, C.H., "Comparison of Organoleptic and Physicochemical Methods for Determining Quality in Fresh, Frozen and Canned Lima Beans." Food Research 5, 583-92 (1940). - Qualitative estimations of catalase activity, and semi-quantitative determinations of peroxidase activity and pigment content were unsuitable as quality indexes for frozen and canned Lima beans. The I-threshold test was a good measure of quality. The procedure of Joslyn, Bedfore and Marsh (C. A. 32, 9318.) for vitamin C determination was used with some modification. Ten gram samples of beans were ground with 2 grams of quartz sand in the presence of 25 milliliters of a mixture of 2% H_3PO_3 and 8% H_2SO_4. The acid extract is strained through double thickness cheesecloth and made up to 60 milliliters with the addition of 8%H_2SO_4. Two milliliters of a 1% starch solution is added, stirred, and an aliquot removed and placed in 1 of the 2 tubes of a Bausch and Lomb quartz colorimeter. A definite amount of 0.01 N.I solution is then added to the rest of the sample. The amounts added were 3 milliliters to the frozen samples, 1.2 milliliters to the canned samples and 5.7 milliliters to the fresh sample. Five drops of a 0.04% aqueous methylene blue

solution was added to the 10 milliliter aliquot which served as the standard. The tube containing the standard was raised to read 15 on the colorimeter scale. An aliquot of the solution to which the I had been added was then placed in the other tube of the colorimeter and adjusted to the color of the standard. The value thus obtained was designated as the I-threshold value. This test gave excellent checks with organoleptic tests. Of the factors affecting quality, preblanching was most important. Over blanching reduced the I value significantly more than the organoleptic value. There was an inverse relation between the two tests as affected by brine separation.

C. A. 35, 2995 (1941).

(981) Kramer, A. and Smith, H.R., "Preliminary Investigation of Measurement of Color in Canned Foods." Food Research 11, No. 1, 14-31 (1946). - Factors affecting color of canned foods. Methods of color measurement, disc colorimeter and spectrophotometer discussed. Color measurements as determined experimentally for canned vegetables, tomatoes, green and wax beans, lima beans, beets, carrots and corn.

F. F.

(982) Krause, M., "In the Freezing of Foodstuffs." Eng. Progress 3, No. 1, 7-10 (1922). - Discusses investigations carried out in Germany regarding processes of freezing pork, beef and fish.

E. I. 1922, 159.

(984) Kuprianoff, I., "The Fast Freezing of Meat " Zeit Fuer Die Gesamte Kaelte-Ind. 30, No. 12, 213-14 (1932). - Rapid freezing of meat; report of experimental investigation at Refrigerating Engineering Laboratory of Karlsruke Institute of Technology on results of experiments.

E. I. 1932, 1112.

(985) Lal, G., "Studies in the Preservation of Fruit Juices. IV Vitamin C (ascorbic acid) Content of Citrus Fruit Squashes." Indian J. Agric. Sci 14, No. 2, 171-80 (1944). - Preheating, irrespective of methods of preservation, reduced loss of vitamin C in orange juice, but had the opposite effect with lemon juice. The vitamin was better preserved at a sugar syrup of 45° Brix than at 65°. SO_2 was similarly more effective than pasteurization or addition of sodium benzoate.

B. A. 19, 2176 (1945).

(986) Lampitt, L. H. and Moran, T., "Palatability of Frozen Meat." Soc. Chem. Industry J. (Trans. & Communications) 52, No. 21, 143T-6T (1933). - Experiments undertaken to compare palatability of meat rapidly frozen with similar meat frozen much more slowly.

E. I. 1933, 960.

(987) Lang, O.W. and Farber, L., "The Preservation of Tuna by Chilled Brines: A Progress Report." Proc. Sixth Pacific Sci. Congr. 3, 281-289 (1939-40). The rate of cooling and of salt penetration into tuna during immersion in sodium chloride brines of varying concentrations at temperatures ranging from 30° to -5°F. were investigated. The salt penetration varied inversely as the rate of freezing; the more rapidly the outer layers of the fish are chilled, the smaller will be the amount of salt entering the flesh. For fish immersed directly into cold strong brine the major portion of the salt penetration occurs during the time the fish are chilled from the sea water temperature to about 30°F. Tuna were kept in sodium chloride brines at 10° and -5°F. up to 150 days in a good state of preservation with no deterioration; at 30°F. and at 22°F. fish showed signs of spoilage after 7 days and 21 days respectively. The denaturation of tuna proteins was greatest at 30°F. with no appreciable changes in their state at temperatures lower than 10°F. The significance of these results for their application to fish freezing practices on the tuna boats is indicated.

E. M. F.

(988) Lankler, J.G. and Morgan, O.M., "How Wetting Agent Improves Chemical Peeling Process." Food Ind. 16, No. 11, 888-91, 940 (1944). - Peeling time of fruits and root vegetables reduced by addition of alkylaryl sulphonate to lye solution; this permits increased production at same temperature, or allows lower temperature or lower caustic concentration; procedure described.

E. I. 1944, 413.

(989) Lassen, "Frozen Food Packaging Materials Containing No Paraffin or Cellophane." Zeit Fuer Die Gesamte Kaelte-Industrie 47, No. 10, 152-6 (1940). - Frozen food packaging materials containing no paraffin and cellophane; advantages of paraffin-free and cellophane-free packaging material pointed out and recommendations made for development of suitable impregnating agents for this purpose.

E. I. 1941, 866.

(990) Lathrop, "Cold Packing Red Sour Cherries." Canning Age 8, 837-839, 903-908 (1927).

(991) Lathrop, C.P. & Walde, W.L., "Change in Concord Grape Juice Composition by Freezing Storage" Fruit Prod. J. & Am. Vinegar Ind. 7, No. 5, 26-7 (1928). - The analytical data show conclusively no chemical change occurs in the composition of grape juice due to freezing storage, aside from the removal of about 50% of the cream of tartar, which is approximately the same quantity that is removed in 16 months by the old method of storage. Grape jelly prepared from the juice held in freezing storage will be very superior in natural grape flavor and color to that made from the same original juice pasteurized and held 16 months at ordinary cellar storage temperature.

C. A. 22, 828 (1928).

(992) Lea, C.H., "Chemical Changes in the Fat of Frozen and Chilled Meat. I. Frozen Mutton and Lamb." J. Soc. Chem Ind. 50, 207-13T (1931). - Changes in the fat of carcasses were followed during precooling, cold storage at freezing temperatures or lower and hanging at room temperature after storage. Free acidity changes were slight, the maximum corresponding to 1.2% free oleic acid. Superficial oxidation of the fat was too slight to affect the flavor even after 7 months at 5°C. Storage at -5°C failed to prevent the growth of yeasts and molds on the carcasses, particularly on the fore quarters. No visible growth occured at -10°.

C. A. 25, 4631 (1931).

(993) Lea, C.H., "Chemical Changes in the Fat of Frozen and Chilled Meat. II. Chilled Beef." J. Soc. Chem Ind. 50, 215-20T (1931). - In commercial practice the "life" of chilled beef, as determined by the absence of unpleasant flavor in the fat, is limited by the growth of microorganisms. Oxidation plays a subsidiary but still important part. In carcasses stored 42-60 days at 0°C or -1.6°C. followed by hanging at 8.5°C. or 10°C. for 4 days atmospheric oxidation was not sufficient to make the superficial fat unpalatable except in those cases where fat was exposed to fairly strong light.

C. A. 25, 4632 (1931).

(994) Lea, C.H., "Chemical Changes in the Fat of Frozen Meat. III. Bacon." J. Soc. Chem. Ind. 50, 343-9T (1931). - Cf. Ibid. 50, 215 (1931). Unsmoked tank-cured bacon was kept up to 152 days at -10°C. then at 15°C. for 18 days. There was no indication of attack by microorganisms. Any rancid flavor in the fat was due to oxidation and not to increase in free fatty acids. Smoking retards the oxidation, at least superficially.

C. A. 25, 5939 (1931).

(995) Lea, C.H., "A Note on the Changes in the Fat of Frozen Mutton." J. Soc. Chem. Eng. 50, 409-10T (1931). - C. A. 25: 4631 - The previous observations were extended to still longer periods of cold storage. After 18 months at -10° the fat of mutton was still in good condition, as shown by flavor, low content of free acid and small percentage of active O. The keeping qualities were not impaired, since after 3 days thawing out at 12° the flavor was still good and the free acid had increased only 10%.

C. A. 26, 780 (1932).

(996) Lea, C.H., "Chemical Changes in the Fat of Frozen and Chilled Meat. IV. The Protective Influence of Carbon Dioxide on the Fat of Beef Stored at 0°." J. Soc. Chem. Ind. 52, 9-12T (1933). - Cf. Ibid. 50, 409 (1931). CO_2 has a marked effect in retarding the onset of taint in beef fat at 0°. In a saturated atmosphere the time required for the production of a perceptible "off" flavor was approximately doubled in the presence of 10% CO_2. At lower humidities the protection afforded by the gas was somewhat increased but gas storage was less effective in delaying the appearance of taint when commenced 5 or 6 days after slaughter. For the purpose of protecting the fat comparatively little advantage results from increasing the CO_2 concentration beyond 15 or 20%. These (or higher) concentrations of the gas appear to have no harmful effect on the flavor of the fat, or on its resistance to oxidation during a storage period of 50 days.

C. A. 27, 1683 (1933).

(997) Lea, C.H. Rancidity in Edible Fats. Department of Scientific and Industrial Research (Britain), Food Investigation Board, Special Report No. 46, 1938. 230 pages. - Review on the chemistry of fats, and the causes and control of rancidity. References.

C. A. 32, 5649 (1938).

(998) Lee, F A., "The Influence of Sampling on the Accuracy of the Tenderometer." Canner 89, No. 12, 13 (1939).

(999) Lee, F A., "Determination of the Quality of Vegetables." Proc. First Food Conf. Inst. Food Technologists, 33-38 (1940). - A resume of many of the objective tests that have been proposed for use on fresh and canned peas and corn is given. A discussion of the difficulties of the application of many of these tests to frozen peas is brought out, together with mention of the work that is being done and that which has been accomplished in connection with the frozen packed vegetables.

B. A. 15, 1739 (1941).

(1000) Lee, F.A. Objective Methods for Determining the Maturity of Peas, With Special Reference to the Frozen Product. New York Agric. Expt. Sta. Tech. Bull. No. 256, 1941. 17 pages. - Cf. 2nd Eng. Chem Anal. Ed. 13, 38 (1941); 2nd Eng. Chem. Anal. Ed. 14, 241 (1942). The method depends upon the determination of specific gravity of the thawed sample by means of difference in weight in a mixture of xylene and CCl_4 (specific gravity 1.000) and in air. The frozen peas are preferably thawed in pliofilm bags at 150°F., then drained for 2 minutes previous to weighing. Equipment required and method of calculating results are described. The determination of alcohol-insoluble solids was modified by processing the thawed peas at 240°F. for 30 minutes. The peas were then cooled, drained and run in the usual way When used for the raw vegetable, specific gravity was not reliable as a quality-grading guide, probably because of gases in the tissues. Alcoholic-insoluble solids on the raw peas gave somewhat better results than specific gravity. The texturemeter and tenderometer were compared on raw and blanched samples. The tenderometer can be satisfactorily used for determining the grade of blanched and size-separated peas. The values obtained by means of the texturemeter showed reasonably good correlation with those obtained with the tenderometer. A table of coefficients of correlation is given.

C. A. 36, 4212 (1942).

(1001) Lee, F.A., "Determining the Maturity of Frozen Peas." Ind. Eng. Chem. Anal Ed. 13, 38-9 (1941). - The specific gravity of thawed peas is determined by means of the difference between the weight of the sample in air and in a mixture of xylene and CCl_4 that has a specific gravity of 1.000. The method is more rapid than the determination of alcohol-insoluble solids and the correlation of the results with organoleptic tests is nearly the same for both methods. The correlation is better than with the method of the Agricultural Marketing Service.

C. A. 35, 1533 (1941).

(1002) Lee, F.A., DeFelice, D., and Jenkins, R.R., "Determining the Maturity of Frozen Vegetables. A Rapid Objective Method for Whole Kernel Corn." Ind. Eng. Chem. Anal. Ed. 14, 240-1 (1942). - There is a high correlation between the results of organoleptic tests of the maturity of whole-kernel corn and the specific gravity as determined by the difference in weight in air and in a salt solution of specific gravity 1.000. Also in: Canner 96, No. 26, 11, 13, 24 (1942).

C. A. 36, 2638 (1942).

(1003) Lee, F.A., "Determination of the Maturity of Frozen Peas." Ind. Eng. Chem. Anal. Ed. 14, 241 (1942). - Cf. Ibid. 13, (1941). A salt solution with a specific gravity of 1.000 is preferable to the xylene-CCl_4 mixture used in the original method.

C A. 36, 2638 (1942).

(1004) Lee, F A., "Determination of Toughness of Frozen Asparagus, Asparagus Officinalis." Food Res. 8, No. 3, 249-53 (1943). - An objective method for determining the toughness of frozen asparagus involving the determination of the substances insoluble in 80% ethyl alcohol was found to be successful, as indicated by the coefficient of correlation of these results with the corresponding organoleptic tests. Possible standards of quality based upon this method are suggested.

B. A. 17, 2185 (1943).

(1005) Lee, F.A., "Cold Dip & Scalding Methods for Fruits. I and II." Quick Frozen Foods 7, No. 2, 35; No. 3, 38, 42 (1944). - In freezing apples, apricots and peaches, treatment of the slices with SO_2, sodium sulfite, steam or hot water is necessary to prevent darkening. The chemical treatment may impart slight foreign flavors. Sodium sulfite is used at the rate of 1¼ lbs. per 20 gal. water. Steaming is for 90 seconds and is considered somewhat superior to other methods.

B. A. 19, 773 (1945).

(1006) Lee, F.A. and Whitcombe, J., "Blanching of Vegetables for Freezing. Effect of Different Types of Potable Water on Nutrients of Peas and Snap Beans." Food Research 10, No. 6, 465-8 (1945). - Blanching tests (using procedure of blanching in rapidly boiling water for from 60 seconds to two minutes) to test differences encountered in use of different types of potable water. Vegetables blanched in hard water showed increases in calcium. Other than this there were no significant differences in mineral or vitamin content. Vegetables tested were peas and snap beans.

F. F.

(1007) Lee, F.A., Gertner, W.A. and Whitcombe, J., "Effect of Freezing Rate on Vegetables." Ind. & Eng. Chem. 38, No. 3, 341-6 (1946). - Five different rates of freezing were employed ranging from very rapid, by means of liquid air, to very slow, in an insulated box. Peas and snap beans were blanched, frozen, and stored at -6° F. for six months. Analyses were made for ascorbic acid, carotene, and thiamine. Riboflavin was run on peas only. Analyses were made on raw, blanched, and frozen samples, and again after six-month storage and after cooking. Significant differences in vitamin content could not be detected among the samples from the rates of freezing studied. Significant differences in taste and texture were not observed, with the exception of the texture of those frozen in liquid air. These were somewhat softer, probably because of cracking that took place during freezing. Photomicrographs show that the slower the rate of freezing, the larger the ice crystals; but in the corresponding thawed samples, these differences disappeared, and damage was not apparent.

Author's Digest.

(1008) Leech, C., "Notes on Cold Storage." Refrig Eng. 43, No. 1, 22 (1942). - Usual arrangement of refrigerated space; comparison of insulation materials; equipment for plants operating both freezer and cooler space. Before Am. Soc. Refrig. Engr.

E. I. 1942, 236.

(1009) Leech, C., "New Demands for Low Temperature Refrigeration." Refrig. Eng. 44, No. 5, 305-7 (1942). - Author reviews some of new applications of low temperature refrigeration, stating that many a plications in this range may not be mentioned for military reasons; quick freezing of foods, dehydration, chilled rivets, many used in process industries are only few of current demands in low temperature field. Before Am. Soc. Refrig. Engrs.

E. I. 1942, 922.

(1010) Lehmann - Oliva, W., "Determination of the Permeability of Packing Materials to Water Vapor." Z. Ges. Kalte-Ind. 47, 191-3 (1940). - Cf. C. A. 34, 7107. - In the packing of frozen foods, it is of primary importance that the packing material be impervious to water vapor. Experimental apparatus for the determination of the permeability of packing materials to water vapor is described.

C. A. 37, 6749 (1943).
C. Z. I, 3162 (1941).

(1011) Lemon, J.M. Reducing the Shrinkage of Frozen Fish in Cold Storage. U S Bureau Fisheries, Investigative Report No. 9, 1932. 12 pages. - Samples of fish were coated with a film of several vegetable oils (cottonseed, peanut, corn, hydrogenated cottonseed), and, after freezing, were stored at -10°F. A sample of fish frozen and glazed with water served as a control. The loss of weight of each sample due to evaporation of moisture was determined each week for 12 weeks. Least loss was observed in a sample treated with hydrogenated cottonseed oil, 5.3%; next lowest, with cottonseed oil, 5.9%; loss with other oils was: peanut 14.0%, corn 12.8%. The water glaze disappeared in 3 to 5 weeks; this sample showed a total loss of 22.7%.

B. A. 7, 406 (1933).

(1012) Lemon, J.M. Developments in Refrigeration of Fish in the United States. U. S. Bur. Fisheries Invest. Rept. No. 16, 1932.

E. M. F.

(1013) Lemon, J.M. Quick Freezing Systems in the United States of North America. Proceedings American Institute of Refrigeration, 1933. pp. 104-70.

(1014) Lemon, J.M., "Seafood Refrigeration Comes of Age." Fishing Gazette Annual Review 55, No. 10, 80-82 (1938).

(1015) Lemon, J.M., "Suggestions for Storing Frozen Fish." Quick Frozen Foods 1, No. 9, 15, 30 (1939).

(1016) Lemon, J.M. "Fish Refrigeration." Section in Refrigerating Data Book, Volume II, Fifth Edition, 1940. pp. 37-46. - Chemical and physical properties of fish and their importance in freezing preservation and relation to spoilage; chemical composition; fresh and stale fish; freezing methods; freezing of shellfish and crustaceans; storage and transportation; packaging fish and shellfish; calculating refrigeration requirement; bibliography.

F. F.

(1017) Lemon, J.M., "Lactic Acid as an Index of Keeping Quality of Frozen Fish." Proc. 30th Ann. Mtg. Am. Inst. of Refrig., (1941).

(1018) Levinstein, H. and Lindemann, F.A., "Research at Lowest Temperature." Indust. Chem. 12, No. 142, 481-2 (1936). - Methods of obtaining very low temperatures; purpose of low temperature research; phenomena which appear at low temperatures; recent developments.

E. I. 1937, 658.

(1019) Levinstein, H. and Lindemann, F.A., "Research at Low Temperatures & Its Importance to Industry." Instn. Chem. Engrs. - Trans. - 14, 113-8 (1936). - Cf. Engineering 143, No. 3704, 32-3 (1937). - Discussion, among other things, of method by which gases have been liquefied; new method of cooling substances introduced during last few years by author.

E. I. 1937, 658.

(1020) Lind, W.J., "Design of Cold Storage Plant IV, V & VI." Modern Power & Eng. 35, No. 10, 35-6; No. 11, 29-30; No. 12, 29-30 (1941). - Selection and layout of equipment used in fruit storage plant; rate of temperature drop and average fruit temperature during "pull down". See also: Engineering Index 1941, p. 261.

E. I. 1942, 236.

(1021) Linge, K., "Refrigerating Machinery for Low Temperatures." Genie Civil 110, No. 2854, 380-1 (1937). - Low temperature system of -20 to -60°C. Cf. VDI Zeit, Oct. 24, 1936.

E. I. 1937, 978.

(1022) Linge, K., "Some Special Applications of Refrigeration." Zeit Fuer Die Gesamte Kaelte-Industrie 47, No. 7, 98-102 (1940). - Some special applications of refrigeration; use of refrigerating machines for lowering of cooling water temperatures to 10 to 15°C.; application of freezing to shaft

sinking; freezing of food products, with special reference to German Heckermann process, according to which food products are spread out flat and frozen by cooled air of high flow velocity; applications in rayon and chemical industries.

E. I. 1941, 1024.

(1023) Lockhead, A.G. and Landerkin, G.B., "Bacteriological Studies of Dressed Poultry. I Preliminary Investigation of Bacterial Action at Chill Temperatures." Sci. Ag. 15, 765-770 (1935). - Birds held at 30° F. remain about a week longer before reaching the stage of beginning bacteriological spoilage, than those held at 32°F. The bacteria which caused the spoilage were those which grow best at lower temperatures, the so called room temperatures, and fail to grow at incubator temperature: Micrococci, Flavobacteria, and Achromobacter species predominated.

F. F.

(1024) Lockhead, A.G. and Jones, A.H., "Types of Bacteria Surviving in Frozen Pack Vegetables." Food Res. 3, No. 3, 299-306 (1938). - Micrococci (including Staphylococci) proved more resistant to freezing than other types occuring in frozen-pack vegetables. This group comprised a much larger percentage of the organisms in the frozen than in freshly packed vegetables. Though 20°C. permitted development of greater numbers than 37° or 4°, organisms developing at 37° were proportionately the most resistant, and those developing at 4°C. the least resistant to freezing. This is due to the fact that as the temperature of incubation is increased micrococci comprise a higher proportion of the organisms developing. Attention is directed to the importance of the micrococcus group of bacteria in relation to the proper handling of frozen vegetables.

B. A. 12, 771 (1938).

(1025) Loeffler, H.J. and Ponting, J.D., "Ascorbic Acid - Rapid Determination in Fresh, Frozen or Dehydrated Fruits and Vegetables." Ind. Eng. Chem., Anal. Ed. 14, 846-9 (1942). - Twenty-five grams of fresh or frozen sample of high ascorbic acid content, or 50 grams if of low content, or 5 to 10 grams dehydrated material is disintegrated under 350 milliliters 1% metaphosphoric acid in a high speed macerator. No further buffering is necessary. The liquid is filtered through paper, and 3 1-milliliter portions are placed in colorimeter tubes. One of these, diluted with 9 milliliters water, serves as a standard of zero absorbtion with filter No. 520. The other portions are diluted with 9 milliliters of about 13 milligrams per l. indo-phenol dye solution whose transmittance has been determined and is about 30. The transmittance of the samples is determined in a photoelectric colorimeter (the Evelyn was used) exactly 15 seconds after the beginning of the addition of the dye. Calculation was by aid of an equation furnished with the instrument. The use of the filter makes the determinations possible on material that is pigmented.

C. A. 37, 962 (1943).

(1026) Loeffler, H.J., "Velva Fruit. A New Frozen Fruit Dessert." Ice Cream Jour. 40, No 3, 16-17, 68 (1944); Ice & Refrig. 106, No. 5, 263-6 (1944); Ice Cream Field 43, No. 3, 43, 44, 52, 54, 56; Food Packer 25, No. 5, 30-30; Ibid., No. 6, 60-64; Food in Canada 4, No. 5, 49-50. - Frozen fruit puree, melted and with the addition of sugar, gelatin and water when frozen in an ice cream freezer, yields a full whipped frozen dessert noteworthy for nutritive value, flavor, color and texture. Fruit juices of

raspberries, boysenberries, loganberries, youngberries, Santa Rosa plums, strawberries, and similar fruits can be used. The composition is typical of a milk sherbet except that fruit solids have been substituted for milk solids.

B. A. 18, 2398 (1944).

(1027) Loeffler, H.J., "Retention of Ascorbic Acid in Strawberries During Processing, Frozen Storage, and Manufacture of Velva Fruit." Food Research 11, No. 1, 69-83 (1946). - Paper reports studies on losses of ascorbic acid from frozen strawberries because of condition of fruit; and during freezing, short storage, extended storage, defrosting, also during pureeing and manufacture of Velva Fruit. Findings showed that maturity, freezing, sugaring, and slicing caused losses in ascorbic acid content. Loss was less in pulping, manufacture of Velva Fruit and in some types of defrosting.

F. F.

(1028) Von Loesecke, H.W., Outlines of Food Technology. New York: Reinhold Publishing Company, 1942. - A text-and-reference-book, describing briefly the processes used in modern food industry. The chapters deal with, among other things: Storage and Marketing of Fruits and Vegetables; and Preservation of Foods by Freezing.

B. A. 16, 1852 (1942).

(1029) Loeser, E., "The Planning of Cold Storage Rooms with Special Regard for Biological and Physio-chemical Changes in Stored Goods." Zeit Fuer Die Gesamte Kaelte-Industrie 48, No. 2, 17-23 (1941). - Construction of cold storage rooms with special reference to physical chemical changes in stored goods; discussion of various types of changes as influenced by cold storage temperature, humidity and air circulation; suggestions concerning design and construction of machinery and equipment of cold storage plants.

E. I. 1941, 261.

(1030) Lord, B., "New Public Freezing Plant Opens." Ice & Refrig 102, No. 2, 130-1 (1942). - Commercial plant in Florida described; used for meat and seafood.

E. B.

(1031) Lovern, J.A., "The Effect of Preservation Processes on the Vitamin Content of Fish." Proc. Nutrition Soc. (Engl. and Scot.) 2, 100-4 (1944). A review of the effects of freezing and cold storage, smoking, salting and drying, and canning on the vitamin content of fish.

C. A. 39, 3599 (1945).

(1032) Lowe, B. and Keltner, F., "Cooking Studies with Frozen Poultry." U. S. Egg and Poultry Mag. 43, 296-9, 314-7 (1937).

(1033) Lowe, B., "Tests for Determining Quality in Meats and Other Food." J. Home Ec. 30, 567-8 (1938). - Tenderness and juiciness tested by various types of apparati; also tests for texture of fats and fruits mentioned. From paper presented at 31st Annual meeting of the American Home Economics Association.

F. F.

(1034) Lowe, B. Effect of Drawing Before Freezing on the Palatability of Poultry. Proceedings of 7th World's Poultry Congress, 1939. pp. 500-505.

(1035) Lowe, B. & Hoffman, K., "Cooking Studies with Frozen Poultry." U. S. Egg and Poultry Mag. 45, 156-9 (1939).

(1036) Lowe, B., "Processing and Storage of Frozen Foods." Jour. Amer. Diet. Assoc. 21, No. 5, 277-278 (1945). - In 1944 frozen fruits and vegetables were far above the five year average. Initial quality affects the frozen product materially. Variety, manner of storage and of processing are important factors for vegetables. In meats, fats deteriorate more rapidly than muscle; freezing usually increases tenderness, but the frozen product is more dry; storage decreases both juiciness and flavor. Storage temperature of -10°F. gave better quality peas than 0° and much better than plus 10°. Fluctuation of temperature caused very rapid deterioration of quality. Foods can be held under favorable conditions for 3-8 months with little loss of quality.

B. A. 20, 53 (1946).

(1037) Lowey, R.E., "Packaging Quick Frozen Foods." Quick Frozen Foods 1, No. 2, 16-18 (1938).

(1038) Ludewig, W., "The Critical Cooling Time and Optimum Storage Temperature for the Fast Freezing of Provisions." Z. Ges. Kalte-Ind. 39, 176-9 (1932).

C. A. 27, 1683 (1934).

(1039) Lueckmann, K. H., "Automatic Packaging of Frozen Food Products in Cellophane." Zeit Fuer Die Gesamte Kaelte-Industrie 47, No. 11, 176-7 (1940). - Automatic packaging of frozen food products in cellophane; two conveyorized schemes briefly described and illustrated.

E. I. 1941, 866.

(1040) Lumley, A., "Refrigeration in Fish Industry with Special Reference to Progress of Certain Scientific Researches." Brit. Assn. Refrig. Proc. 32, No. 1, 101-23, 124-35 (1935-36). - Informal discussion of modern refrigeration methods used in preservation of fish. Appendix by J. Pique, entitled "Description of Operation of Suggested Fish Freezing Plant."

E. I. 1936, 953.

(1041) Lumley, A., "Refrigeration in the Fish Industry." Ice & Cold Storage 39, 11-12 (1936). - Quick freezing of fish yields more satisfactory products than slow freezing; quick freezing allows the flesh when thawed to retain more completely its original water, salt, and flavor content.

C. A. 30, 3536 (1936).

(1042) Lutz, J.M., Caldwell, J.S. & Moon, H.H., "Frozen Pack: Studies on Fruits Frozen in Small Containers." Ice & Refrig. 83, No. 3, 111-13 (1932). Cf. Food Industries 4, No. 12, 402-5 (1932). Two methods of preserving fruits by freezing; moderate and very low temperatures; action of freezing on all walls of plant tissue: methods used in experiments on peaches,

strawberries and apple cider; effect of freezing upon containers. Bibliography.

E. I. 1932, 1111.

(1043) Lutz, J.M., Caldwell, J.S., Moon, H.H. & Myers, A.T., "The Quality of Different Varieties of Eastern Strawberries When Frozen in Small Packages." Fruit Prod J. & Am. Vinegar Indust. 13, No. 1, 7-10 (1933). - The varieties appearing best suited for freezing preservation in small-consumer packages were Fruitland, Joe, and Big Late, although Bellmar, Blakemore, Chesapeake, Howard Supreme, Klondike, Lucky Strike, McClintock 98, Nancy Lee, Progressive (Champion) and Redheart were also good. Extremely low freezing temperatures were no better than 0 to 15° F. Non-airtight containers generally resulted in considerable oxidation in this type of container. A packaging medium of 50-60% sugar syrup was most desirable in small-consumer packages, although a sugar pack may be preferable for freezing in large containers.

B. A. 8, 1524 (1934).

(1044) Lutz, J.M., Wright, R.C. and Caldwell, J.S., "Preservation of the Young and Lucretia Varieties of Dewberries by Freezing." Fruit Prod Journal & Amer. Vinegar Indust. 13, No. 9, 267-269, 281 (1934). - Experiments with Young dewberries grown in Georgia and Virginia showed that the flavor of this highly perishable fruit could be retained for dessert purposes by freezing in 45-50% sugar syrup. Young dewberries may be frozen either with or without added sugar for subsequent use in preserves, ice cream or sherbets. Lucretia dewberries can be preserved for dessert purposes by freezing in 50° syrup. Although air-tight containers retain the flavor and appearance of dewberries best, non-airtight containers were very satisfactory. A freezing temperature of 0°F. and a subsequent storage temperature not exceeding 10-15° are recommended.

B. A. 9, 605 (1935).

(1045) Lutz, J.M., Moon, H.H. and Caldwell, J.S., "Possibilities of Preserving Red Raspberries by Freezing in the Eastern States." Fruit Prod. Jour. & Amer. Vinegar Indust. 13, No. 10, 300-301 (1934). - The appearance, texture, and flavor of four varieties of red raspberries after several month's storage at freezing temperatures were very similar to those of fresh fruit when packed in 40-50% sugar syrup. Packing in hermetically sealed containers aided in retention of flavor and color. Dry sugar packs or packs with neither sugar nor sirup were less desirable than sirup packs. A freezing temperature of 0°F. or colder and a storage temperature of 10° or colder is recommended.

B. A. 9, 1096 (1935).

(1046) Luyet, B.J., Biodynamica, No. 29, (1937). - It was demonstrated that gelatin gels containing 37 to 90 percent water could be vitrified by sudden immersion in liquid air. It was further shown that the thickness of the vitreous layer is inversely proportional to the water content; that the temperature range at which material crystallizes is from 0° C. to about -15 C. and that the possibility of obtaining a vitreous state depended on the velocity of crystallization, thus substances with high rates of crystallization could not be supercooled without crystallization and thus could not be vitrified; the vitrifying procedure consists essentially of cooling rapidly enough to cool beyond the range of crystallization before ice crystals have an opportunity to form.

Referred to in (1048).

(1047) Luyet, B.J. and Gehenio, P.M. Biodynamica, No. 33 (1938). - Two kkinds of organisms can support an immersion in liquid air (about -190° C.): (1) those which resist a previous drying, (2) those which do not exceed a few micro in size, e.g., bacteria, yeast ..."

Referred to in (1048).

(1048) Luyet, B.J. & Thoennes, G., "The Survival of Plant Cells Immersed in Liquid Air." Science 88, 284-285 (1938). - It was found that, "to save cells from disintegration, one must use the same means as for saving a gelatin gel from crystallization, that is (1) dehydrate them, (2) cool them rapidly, (3) warm them rapidly," and that, "disintegration of protoplasm subjected to extremely low temperatures is due to crystallization and any method, such as vitrification, which prevents crystallization, prevents protoplasmic disorganization." Authors studied "if and to what extent protoplasm vitrified at low temperatures" and if "protoplasm hard and breakable like glass but in which water had not crystallized, keeps its vitality." Cf: Biodynamica, No. 33 (1938) - B. J Luyet and P. M. Gehenio; Biodynamica, No. 29 (1937) - B. J. Luyet.

F. F.

(1049) Lythgoe, H.C., "Cold Storage of Food." Ind. Eng. Chem. 35, 29-38 (1943).

C. A. 37, 952 (1943).

(1050) Mac Arthur, M., "Freezing of Commercially Packaged Asparagus, Strawberries, and Corn." Fruit Prod. Jour. 24, No. 8, 238-40 (1945). - The time required for complete freezing of asparagus, strawberries, and corn by different methods, and at two temperatures, was established. The most rapid freezing was by direct air blast on the product. An air velocity of 460 linear feet per minute at 0° F. cut the freezing time of the packaged wet product to one-third of that necessary for static freeze at the same temperature. An air velocity of 300 linear feet per minute accomplished the same results at -20° F. Freezing by air blast on the package at 0° F. was more rapid than static freeze at -20° F. The physiological condition of the product affected the freezing time. Very high air velocities in the freezing rooms did not decrease the freezing rate proportionately.
B. A. 20, 187 (1946).

(1051) MacArthur, M., "Apples: Experiments in Freezing Preservation." Can Food Packer 16, No. 4, 17-8 (1945). - Experiments were carried out on pretreatment with H_2SO_3, Na_2SO_3, and $K_2S_2O_5$ followed by freezing. H_2SO_3 was entirely successful in preventing browning, but the apple sections broke down when subsequently cooked for use. Partial to complete elimination of browning was obtained with Na_2SO_3 treatment, but the product was somewhat yellowed. $K_2S_2O_5$ not only prevented browning, but no other discoloring occurred and the sections retained their shape on cooking. After paring and coring, if the apples are not sectioned immediately they should be held in a 1.0-1.5% brine to prevent discoloration; and similarly is $K_2S_2O_5$ pretreatment is not carried out immediately following sectioning. The sections are dipped for one minute in a 0.5% $K_2S_2O_5$ solution, held in open containers for at least two hours to permit penetration of the solution into the interior of the sections, and frozen in closed containers at 0° to -10° F. Cf. Food in Canada 16, No. 4, 17-18 (1945): "Apples, Experiments in Freezing Preservation." Ibid. No. 18, 13-14: "Freezing Apples for Lockers."
C. A. 39, 3372 (1945).

(1052) Mack, M. J. and Fellers, C. R. Frozen Fruits and Their Utilization in Frozen Dairy Products. Massachusetts Agriculture Experiment Station, Bulletin 287, 1932.

(1053) Mackinney, G. and Weast, C. A., "Color Changes in Green Vegetables - Frozen-Pack Peas and Stringbeans." Ind. Eng. Chem. 32, 392-5 (1940). - Much of the chlorophyll in frozen vegetables changes to pheophytin. This is determined by the spectroscope and by the saponification products. Blanching reduces the amount of color change by removing air and volatile and water-soluble constituents that would react with the chlorophyll. The effect of blanching is less with beans than with peas.
C. A. 34, 2484 (1940).

(1053A) Mackinney, G. Summary Report on German Research and Technology in Food. F. I. A. T. Final Report No. 82. Office of the Publication Board (Washington) Report No. 1250, Sept. 21, 1945. 10 pages. - As regards German accomplishments in frozen foods, the author reports that "a few engineering problems have been solved". Three developments are mentioned: a continuous

"paternoster" type of quick freezer, the drum-freezing of juices (also reported by R. L. Perry), and quick-freezing in liquid nitrous oxide. "The latter two seem to have definite applicability in the United States. With respect to the use of nitrous oxide it is not evident that nitrous oxide is the ideal liquid-gas system, but the principle involved is novel." Only a brief description of the process is given; reference should be made to (1054).

B. H. W.

(1054) MacKinney, G., "Immersion Freezing in Liquid Nitrous Oxide." Food Ind. 18, No. 5, 81-83, 230, 232, 234, 236 (1946). F. I. A. T. Final Report No. 212. Office of the Publication Board (Washington) Report No. 1269, Oct. 8, 1945. 9 pages. - While the nitrous oxide immersion freezing method was primarily developed by the I. G. Farbenindustrie, in a pilot plant near Hochst, to provide an outlet for nitrous oxide, the process may be applicable in the United States. The author describes in detail the nitrous oxide cycle, the food cycle, operational details, details of the nitrous oxide system (compression, removal of moisture, cooling, and reduction to one atmosphere), the food freezing cycle, the preparation of foods prior to freezing, freezer storage, etc., and gives, in "Comments on Method", detailed sample calculations. Other possible refrigerants (carbon dioxide - not very suitable; Freons - possible) are discussed. The use of nitrous oxide for immersion freezing differs from immersion freezing in precooled brine, syrup, or glycerine in that advantage is taken of both the sensible and latent heats of the primary refrigerant. Vegetables are usually packaged prior to freezing, but fruits are not. "There appears to be no harmful or residual effect on the food as a result of this practice." Equipment is described. Losses of nitrous oxide are small. A food freezing period of twenty minutes is mentioned. Three figures are shown in the article.

B. H. W.

(1055) Madsen, H. S., Litwiller, E., and Wiegand, E. H., "Beet Blanching Methods Evaluated" Food Indust. 16, 983 (1944). - Studies of time and temperature factors indicate that pressure cooking of cut beets is a better practice than steam blanching. Adequacy of the benzidine test for peroxidase inactivation is questioned.

E. M. F.

(1056) Maerz, A. and Paul, M. R., Dictionary of Color. New York: McGraw Hill Book Co., 1930.

(1057) Mageon, C. A., "What Causes Changes in Frozen Fruit." Food Ind. 2, No. 1, 141 (1930).

(1058) Magoon, C. A., "Spoilage in Frozen Pack Fruits." Glass Container 9, No. 5, 5 pp. 46-8 (1930); Nat'l Provisioner 84, No. 6, 33 (1931). "Frozen Food Spoilage." - Discoloration at the surface of frozen packs of fruits with or without sugar is due to oxidative changes of certain constituents of the fruits in the presence of air. Eastern-packed strawberries contained from 19,000 to 800,000 viable microorganisms per gram. Approximately 62% were bacteria, 26% molds, and 12% yeasts. Fermentation due to yeasts and molding at the surface by mucor and penicillium types of mold, are the

common forms of spoilage. Careful washing of the fruit previous to packing together with prompt freezing and continuous storage at very low temperatures is a means of reducing the count of microorganisms and avoiding spoilage.

C. A. 24, 1908 (1930).

(1059) Magoon, C. A., "Keeping Quality as Related to the Distribution Problem" Ice & Refrig 80, No. 1, 39-41 (1931). - Alterations in color and flavor; relationship of microorganisms; handling frozen vegetables. Before Frozen Foods Conference.

E. I. 1931, 1205-6.

(1060) Magoon, C. A., "Microorganisms as Affecting Frozen Foods." Ind. Eng. Chem. 24, 669-71 (1932). - Molds, yeast and bacteria are not completely destroyed by freezing temperature. Some are known to resist a temperature of -252° for several hours. About 90% may be killed in the first twenty-four hours of freezing, but enough are left to cause spoilage as soon as the temperature rises. Proper washing or blanching only partially reduces the bacterial count. The freezing process softens the food and thus favors microbial growth when the food has thawed. Pathogenic organisms, including Clostridium botulinum, may survive freezing in sufficient numbers to be a source of danger, if the food is allowed to stand after thawing.

C. A. 26, 3854 (1932).

(1061) Malcolmson, J. D., "Paperboard Containers for Frozen Foods." Food Ind. 2, No. 4, 155 (1930). - Rapid development in frozen-food industry has been intimately connected with parallel development of paper-board containers for packaging these products; research work and advantages of corrugated containers.

E. I. 1930, 1278.

(1062) Malcolmson, J. D., "New Shipping Container Developed for Frozen Orange Juice." Fruit Prod. J. 10, 207, 226 (1931). - Robert Gair Co. uses moistureproof corrugated container sealed with new asphalted tape.

F. F.

(1063) Mallman, W. L. and Zaikowski, L., "Microbiologists' Studies on Bacteria Isolated from Cold Storage Meat and Meat Products. I Identification II Effect of CO_2 on growth." Proc. First Food Conf. Inst. Food Technologists, 385 (1940).

(1064) Mallmann, W. L., "Sanitation in Frozen Food Locker Plants." Quick Frozen Foods 7, No. 6, 80-81, 88 (1945). - It is essential that foods enter the freezer with a minimal bacterial population. To this end food handlers and water supply should be examined periodically; plant must be kept clean and sanitary by means of heat or chemical sanitation. Care must be taken to eliminate the disease producing bacteria and the spoilage microorganisms.

F. F.

(1065) Mandeville, P., "The Quick Freezing of Poultry." Refrigerating Eng. 34, 149-52 (1937). - A review of problems.

C. A. 31, 8730 (1937).

(1066) Mann, L. K. and Weier, E., "Some Factors Affecting the Variability of Dehydrated Carrots." Fruit Prod. Jour. 23, No. 10, 309-11, 317 (1944). - (In a lengthy discussion of dehydration of carrots it was pointed out that): probably variations in blanching are associated with variations in the state of carotene in the dry product.

B. A. 18, 2400 (1944).

(1067) Mann. Refrigerated Food Lockers. Circular C-107, Farm Credit Administration, cooperative Division, Washington D. C., 1938.

(1068) Manning, J. R. Fish and Shellfish for Food. Memorandum 2256B, U. S. Bureau of Fisheries, 1934.

(1069) Markley, R., "Farm Freezer." Refrig. Eng. 44, No. 6, 381-2 (1942). - Illustrated description of frozen food locker plant to make it possible for many thousands of families to freeze and store millions of pounds of food each year, future of locker plant and its place in war effort. Before Am. Soc. Refrig. Engrs.

E. I. 1942, 237.

(1070) Marlatt, A. L., "Cooking of Frozen Vegetables." Refrig. Eng. 38, 92 (1939). - An explanation of the cooking of frozen vegetables, their time saving value and greater retention of vitamins B. and C. The cooking technique for frozen fish and meats is also briefly mentioned.

E. M. F.

(1071) Marsh, G. L. and Joslyn, M. A., "Freezing Storage Problems. Fruit Prod J. 10, 274-5 (1931). - Problems of cost of cold storage and refrigeration during distribution of frozen fruits. Foods which may be frozen with special reference to small consumer packaging. Temperature changes during storage and proper temperatures for thawing.

F. F.

(1072) Marsh, G. L., "Observation on the Loss in Weight of Fruits After Thawing and the Value of the 'Weight Balance' in Frozen Pack Foods." Fruit Prod. J. 11, 335-6, 347 (1932). - Studies on loss in weight upon thawing which "is due in part to the water or juice separated as ice from the fruit during freezing, which later drains from the fruit tissue during thawing and to the osmotic action of the sugar or syrup that may be added." Kind and concentration of syrup show varying effects; the greater the concentration of sugar, the greater the loss of weight.

F. F.

(1073) Martel, "Frozen Meat." Bull. Agr. Intelligence 10, 1016-9; Acad. Med. 81, 585 (1919). - Frozen meat submitted to -10° C. to -15° C. is to be distinguished from refrigerated meats, cooled down to +4 to -1° C. Changes in both kinds of meat are discussed from literature and previous work.

C. A. 15, 2936 (1921).

(1074) Martin, J. W., "The Quick Freezing of Perishable Foodstuffs." Refrig. Eng. 19, 131-3 (1930). - Describes some of the physical and chemical processes which occur during the "quick freezing" of perishable foodstuffs. Quick freezing requires less than ½ hour and thereby prevents concentration of the salts in the center of the product and formation of large ice crystals which rupture the tissue walls and leave the food very susceptible to decomposition and loss of juices when thawed.

C. A. 24, 3835 (1930).

(1075) Martin, L. S., "Quick Freezing Saves Material, Transportation." Refrig. Eng. 44, 174 (1942). - Figures released by Lawrence S. Martin, secretary of the National Association of Frozen Food Packers, indicate that valuable savings in shipping space and material result from quick freezing food products. An amount of canned peas occupy a 64 car freight train where an equivalent amount of frozen peas would only require the equivalent of a 31-car freight train. Cost of materials for packaging a million pounds of quick frozen peas is $12,745.09 whereas the cost of materials for canning these same peas would be $31,715.87.

W. B. C.

(1076) Martin, L., "Effect of War's End upon Frozen Food Industry is Outlined." Western Canner & Packer 37, No. 11, 68 (1945). - Materials for construction of plants and increase in machinery for packers, price controls, transportation problems arising from refrigerated car shortage, relief in warehousing and demand are discussed. Tables given of U. S. stocks of frozen fruits and vegetables.

F. F.

(1077) Martin, T., "Quality Grading of Peas by Brine Separation." The Food Packer 25, No. 5, 34-6 (1944). - Description of the process of quality grading which "will not improve or create the quality of the individual peas (but) will separate those peas of low grade from those of fancy grade." Grading is done in a salt solution and depends on the specific gravity of the peas. The best results are obtained by placing the quality grader after the size grader and the blancher.

B. J. W.

(1078) Martin, W. H. Some Engineering Aspects of Lockers and Home Storage Plants. Oregon State College Eng. Exp. Sta. Circ. Series. No. 4, 1938. 18 pages. - Information on cold storage units for home use.

E. B.

(1079) Martin, W. H., "Humidity in the Freezing Chamber Controls Dehydration (in the Quick Freezing of Foods)." Western Frozen Foods I, No. 7, 3-4, 12 (1940).

(1080) Martin, W. H. and Price, F. E. The Home Freezing Plant. Oregon State College Ag. Exp. Sta. Bulletin No. 399, 1941. 19 pages.

(1081) Martin, W. M., "An Apparatus for Evaluating Tenderness in Peas." Canning Trade 59, No. 12, 108-12 (1937).

(1082) Martin, W. M., Lueck, R. H. and Sallee, E. D., "Practical Applications of the Tenderometer in Grading Peas." Canning Age 19, 146-9, 193-6 (1938).

(1083) Masterman, U. K., Varieties of Vegetables and Fruits for Freezing. N. Y. State College of Home Ec. War Emergency Bulletin No. 96, 1943. 4 pages. - Cf. Cornel U. Bulletin No. 504.

(1084) Masterman, N. K. and Lee. F. A. The Home Freezing of Farm Products. Cornell University Agric. Expt. Sta. Ext. Bulletin No. 611, 1943. 48 pages. - One of the series of bulletins for homemakers.

B. A. 20, 53 (1946).

(1085) Masterman, N. K., "Food Processing by Home Freezing - Subject of Cornell Conference." Refrig. Eng. 46, No. 1, 21 (1943).

(1086) Masterman, N. K., "More on Home Freezing Units." Refrig. Eng. 46, No. 2, 92, 108 (1943).

(1087) Masterman, N. K., "What the Consumer Wants in Frozen Food Packaging." Modern Packaging 17, No. 9, 78-82 (1944).

(1088) Masterman, N. K., "The Patron and the Locker Plant." Quick Frozen Foods 7, No. 5, I-IV (1944). - An exhaustive survey of locker plant operations, based on a study of thirty-one out of thirty-eight locker plants in New York State. Among other statements, it was noted that about 80% of locker plant patrons reused their containers for fruits and vegetables; blanching was found necessary by most; precooked corn, soups, and roasted turkey were found satisfactory; chickens were successfully stuffed before freezing; most patrons preferred freezing because it was less work than canning, saved time, and produced a better product; some plants charged twelve cents a pound, including the cost of the package, for complete processing of fruits and vegetables; 54% of farm patrons would have preferred a home unit; etc.

B. H. W.

(1089) Masterman, N. K., "Using the Home Freezer. I." Quick Frozen Foods 7, No. 12, 92-3 (1945). - A report on (1) the percentage distribution of types of home freezer cabinets among farm, village, suburban, and city dwellers (80-93% of all are top opening; 67% of farm freezers circulate air for freezing, compared with 33% for village and suburban dwellers and only 7% for city inhabitants); (2) the purchase price (or construction cost) of the cabinets (most farm cabinets cost $400-$495) most village freezers cost $200-$395) and most surburban and city-used freezers cost the latter amount or less); (3) the storage temperature maintained - 0° F. in most cases; (4) the cost of operation - usually less than $2.00 to $2.95 per month; and (5) the size of freezers - this ranged from two to eighty cubic feet, with the most common sizes between ten and nineteen cubic feet - chiefly eighteen. The summary was made in New York. Seven tables.

B. H. W.

(1090) Masterman, N. K., "Using the Home Freezer - II - III - IV - V." Quick Frozen Foods 8, No. 1, 94-95, No. 2, 98-9, No. 3, 134-5, No. 4, 128-9 (1945). - II. Survey of cost and types of home freezers; capacity necessary for adequate home supply. III. How foods for freezing are obtained; kinds of foods stored; uses families have made of home freezers (farm, village, suburban, city). IV. Experiences with frozen foods packaging; costs, packaging preferences, accessories. V. Home experiments with freezing foods. Improvements in home freezers. Summary.

B. J. W.

(1091) Masure, M. P. and Campbell, H., "Rapid Estimation of Peroxidase in Vegetable Extracts - An Index of Blanching Adequacy for Frozen Vegetables." Fruit Products J. 23, No. 12, 369-74, 383 (1944). - A simple, reliable and rapid calorimetric method for the estimation of peroxidase activity in vegetable extracts is presented. The procedure developed follows the usual guaiacol-peroxide test with modifications and additions designed (1) to place it on a fairly rapid quantitative basis, with results reproducable within ± 5 to 10%, (2) to produce a measure of initial activity that is constant over a period long enough to permit convenient determination and to indicate reliability, (3) to effect a relatively high degree of sensitivity, (4) to inhibit interference from catalase, which might decompose the low concentrations of H_2O_2 - substrate used, and (5) to protect the activity from destruction in the course of preparation. The method is based on a periodic measurement of the rate of color development in a quaiacol - H2O2 substrate under the catalytic influence of the enzyme present in the tissue extract. Values obtained by the method show definite correlation with degree of blanch and quality retention in stored vegetables preserved by freezing. The quantitative method has been modified to provide a simple semiquantitative method for plant use. Since it is sufficiently accurate to give good correlation with quality retention in a number of frozen vegetables, it may be used to determine adequacy of blanch and to predict the probable storage life of vegetables.

C. A. 39, 2157 (1945).

(1092) Masurovsky, B. I., "Research - Oranges and Their Use in Sherbets and Ices." Ice Cream Trade J. 40, No. 1, 30, 54 (1944). - Orange juice should be prepared shortly before using; without pasteurization, its flavor changes on standing The juice may be concentrated 6-1 and placed in air tight containers or frozen and kept in cold storage. The nutritive value is represented by vitamin C.

B. A. 19, 155 (1945).

(1093) Mauldin, E., "New Quick Freezer Tests Foods in the South." Food Industries 13, No. 10, 46-7 (1941). - Experiments in freezing fruits, berries and poultry, conducted in five states by T. V. A. and Georgia Experiment Station, point way to successful commercial operations; immersion unit on truck freezes products for delivery in refrigerated truck.

E. I. 1941, 1026.

(1094) Mazzola, L. C., "New Caustic Peeling Method Reduces Waste, Saves Labor, ... Value of Brine Peeling Tested." Food Industries 15, 53-4 (1943); Food Industries 15, 51-2 (1943). - Developed for peeling potatoes, principle has application to other root vegetables and to some fruits; it utilizes strong solution and quick penetration with consequent high capacity; inventor will grant licenses for use during war. Brief preliminary

report on method tried at U. S. Dept. of Agriculture, whereby operators of vegetable processing plants can peel potatoes, rutabagas, and possibly other root vegetables by scalding them in hot saturated salt solution and then removing peel in suitable washer; advantages include low cost of salt, absence of personal hazard, and permissable carry over.

E. I. 1943, 425.

(1095) Mazzola, L. C., "Fruit Processing Improved." Food World 17, 134-7 (1945). - Preparation of frozen and canned apples, controlled continuous blanching, rapid cooling, etc.; Musselman Co., Bigheville, Pa.

F. F.

(1096) McCance, R. A. and Widdowson, E. M. The Chemical Composition of Foods. New York: Chemical Publishing Company, Inc., 1940. - Published also as Medical Research Council of Great Britain, special report series No. 235.

(1097) McCleskey, C.S. & Christopher, W.N., "Some Factors Influencing the Survival of Bacteria in Cold-Pack Strawberries." Food Res. 6, No. 4, 327-333 (1941). - Certain pathogenic bacteria inoculated into sliced sweetened strawberries and held at -18°C. were removed after varying periods of storage as follows: Eberthella typhosa 6 months; Staphylococcus aureus 5 months; Salmonella aertrycke and S. schottmulleri one month. S. papatyphi was not recovered at any time from the frozen berries. In strawberries held at 0°C and at room temperature, Eberthella typhosa survived 6 days and 4 hours, respectively. Eberthella typhosa inoculated into unsliced sweetened berries were recovered after 14 months at -18°C. Quantitative determinations of Eberthella typhosa in frozen berries were made with bismuth sulfite agar using 50% sucrose as dilution water; ordinary diluents were not satisfactory.

B. A. 16, 179 (1942).

(1098) McFarlane, V.H., "Behavior of Microorganisms at Subfreezing Temperatures. I Freezing Redistribution Studies." Food Research 5, 43-57 (1940). The effects of solutes on distribution patterns in ice were studied. The yeast-cell distribution pattern differed from sugar, NaCl and HCl. The presence of H ions in a medium hastened the destruction of yeast cells and sometimes markedly altered the distribution patterns of these cells in the frozen mass.

C. A. 34, 2090 (1940).

(1099) McFarlane, V.H., "II Distribution and Survival of Microorganisms in Frozen Cider, Frozen Syrup-Packed Raspberries, and Frozen Brine-Packed Peas." Food Research 5, 59-68 (1940). - In 750 cc. containers of cider frozen and stored at -20°, microbial forms, soluble solids and total titratable acids were concentrated in central cone-shaped areas and in surface areas. There was no marked redistribution of microbial forms, soluble solids of H-ions in frozen syrup-packed raspberries or brine-packed peas. The microorganisms decreased most rapidly in those portions of the frozen mass containing the highest soluble solids content. Large numbers of bacteria remained viable in frozen peas after storage for 24 weeks at -20°.

C. A. 34, 2090 (1940).

(1100) McFarlane, V.H., "Behavior of Microorganisms at Subfreezing Temperatures III. Influence of Sucrose & Hydrogen-ion Concentrations." Food Research 6, 481-92 (1941). - The sucrose syrup used in frozen-food preparation for preservation of color, texture, appearance and general palatibility of the products, is known to allow greater survival of microorganisms. Tests were made to determine the influence of different sucrose solutions on the survival of various organisms (Saccharomyces and E. Coli). Concentration of sucrose, pH of this medium, storage temperature and period of storage all appear to be factors influencing the microbial survival or destruction as well as the nature of the organism itself.

F. F.

(1101) McFarlane, V. H. and Goresline, H. E., "Microbial Destruction in buffered water and in buffered sugar syrups stored at -17.8° C. (0° F.)." Food Research 8, 67-77 (1943). - Greater destruction of microbial cells occurred in water than in any of the syrups. Greater destruction occurred in dextrose syrup than in either invert or sucrose syrup, but there was not always a marked difference in the degree of cold resistance evident in dextrose and inverse syrups.

C. A. 37, 2481 (1943).

(1102) McGuire, L. P., "Fruit and Vegetable Storage." Tropical Agric. (Trinidad) 6, No. 10, 279-284 (1929). - A popular discussion, dealing chiefly with tropical fruits and garden crops.

B. A. 4, 2773 (1930).

(1103) McIntosh, J. A., Tressler, D. K., and Fenton, F., "The Effect of Different Cooking Methods on the Vitamin C Content of Quick-Frozen Foods." J. Home. Ec. 32, 692-5 (1940). - Quick-frozen Brussel sprouts, cauliflower, Lima beans, peas and spinach were cooked in covered stewpans, in steamers and in pressure sauce-pans. Lima beans were cooked in a pressure cooker. The vitamin C destruction was least in the pressure saucepan. Except in the pressure cooker it was less than 15%, which is less vitamin C loss than has been reported for the same fresh vegetables.

C. A. 35, 2627 (1941).

(1104) McIntosh, J. A., Tressler, D K., and Fenton, F., "Ascorbic Acid Content of Five Quick-Frozen Vegetables - As Affected by Composition of Cooking Utensil and Volume of Cooking Water." J. Home Ec. 34, 314-8 (1942). - Composition of cooking utensil has no consistent effect on the resultant ascorbic acid content of boiled vegetables (frosted Brussels sprouts, cauliflower, Lima beans, peas and spinach were tested). No significant differences were noted in ascorbic acid retention in covered and uncovered utensils. As the volume of cooking water increased, the loss of vitamin C became progressively greater; therefore if the maximum retention is to be had, vegetables should be cooked in just enough water to keep them from boiling dry.

F. F.

(1105) McIntosh, J., "The Effect of Preparation for Freezing Storage and Cooking on the Vitamin Content of Vegetables." Food Products J. 23, 143-5, 149 (1944). - A review of the effect of processing storage and cooking on the carotene, thiamine, riboflavin, and ascorbic acid content of frozen vegetables.

C. A. 39, 1939 (1945).

(1106) McIntosh, J., "Vitamin C Content in Fresh and Frozen Vegetables." Quick Frozen Foods 6, No. 12, 24, 34 (1944). - In forty-eight hours at room temperature spinach, broccoli, and Swiss chard lost up to 70% of their vitamine C, green beans 25% in ninety-six hours 85% and 30%. Iced broccoli lost 8% in three days, in a refrigerator 21%. Sprinkling with water is of little value for vitamin retention. Preparation of peas for freezing, especially blanching, may reduce vitamin C by 30%, but freezing storage causes no significant further loss. Nine references are given.

B. A. 19, 43 (1945).

(1107) McKensie, R. A. and Harkness, J. W. R., "Canada Experiments with Ice Fillets." Food Indust. 2, 176-8 (1930). - Biological Board of Canada has established stations at St. Andrews, N. B. and Halifax, N. S. for production of ice fillets; description of equipment and packing.

E. I. 1930, 1499.

(1108) McKinley, L., "Bibliograph of Some Achievements in Chemistry 1930-1941." Univ. Wichita, Univ. Studies, Bull. 11, 60 (1942). - An extensive selective bibliography with entries classified according to ....(many) subjects (including the following: beverages, quick-freezing, vitamins).

C. A. 36, 5066 (1942).

(1109) Mehlitz, A., "Preparation of Fruit Pulp and Marc with Special Regard to Retaining Vitamins and Pectin." Voratspflege u. Lebensmittelforsch 4, 572-623 (1941). - The storability of SO_2 - applied pulp depends on the storage temperature, The increase in storability is not only due to slowing of the autolytic process, but is also due to better retention of SO_2. The carotene content of pulp, in general, is stable and independent of the storage time and type. Loss of vitamin C is considerable with ordinary cellar storage. Refrigeration storage (1-4° C.) acts suitably for protection of vitamin C. Various pulps lost 17-54% during one year storage. Freezer storage (-10° C.) was more unsuitable than by usual refrigeration, except that with currants and oranges better retention of vitamin C occurred. With refrigeration or freezer storage pectin losses are unimportant. Fruit marc, boiled ten minutes and preserved with sodium benzoate, loses practically no carotene during processing and storage. Only with raspberry pulp and marc during the early part of storage was a loss of carotene observed. The vitamin C loss was greater, during a short storage test, in fruit marc than in the pulp.

C. A. 37, 4490 (1943).
C. Z. II, 471-2 (1942).

(1110) Melhart, R. P., "Quick Freezing and Small Containers. The Commercial Problems of Packaging Materials." Ice and Cold Storage 42, No. 496, 107 (1939). - Commercial physics and chemical problems involved in packages to be used for quick frozen foods are discussed. The chemical aspect embraces the minimizing of chemical and enzymic changes in the product by preventing the entrance of outside air. For strawberries the container must be waterproof; for peaches a container able to withstand a vacuum is desirable. A container capable of controlling desiccation of the product is also necessary.

C. A. 34, 184 (1940).

(1111) Melhart, R. P., "Quick Freezing Packaged Products." Cold Storage 42, No. 497, 185-6 (1939). - Discussion of effects of design and material upon time factor; layout of small plant for quick freezing berries, vegetables and peaches by immersion method is shown; theory of quick freezing; ice crystal formation. Before Ore. State College.

E. I. 1939, 1005.

(1112) Melhart, R., "Corn Is Loose-Frozen by Continuous Beet Freezer." Western Canner and Packer 38, 56-9 (1946). - Details of Cascade Frozen Foods plant at Burlington, Washington where corn is frozen both on the cob and cut from the cob. Problems of corn sticking to freezing plates because it is a cut product is dealt with. Solution to problem found in proper application of refrigerating air and correct timing on short belts. Diagrams and explanation of methods presented Additional advantage was found in faster operation.

F. F.

(1113) Melnick, D., Hochberg, M., and Bernard, L.O., "Comparative Study of Steam and Hot Water Blanching." Food Res. 9, No. 2, 148-53 (1944). - A comparative study was conducted of two blanching procedures as used in home canning. The influence of hot water (100° C.) and steam (100° C.) blanching of green snap beans upon enzymes, indophenol, oxidase, peroxidase, catalase, and ascorbic acid oxidase, was evaluated. Hot water blanching of the beans was more effective in destroying the natural enzymes in this vegetable, a three minute exposure being almost completely effective in this respect. Five minutes' steam blanching is necessary for complete inactivation of the enzymes in green snap beans. The disadvantage of hot water blanching resides in the fact that the soluble nutrients of the vegetables, as typified by ascorbic acid, are lost to an appreciable extent in the blanching water. Loss of soluble constituents during steam blanching is not significant. Since the difference between the two blanching procedures in completely destroying the enzymes in the beans in not appreciable with respect to time, the steam blanching method is preferred.

B. A. 18, 1573 (1944).

(1114) Mennie, J. H., "The Freezing of Water in Fish Muscle and in Gelatin". Can. J. Research 7, 178-86 (1932). - From the calometric measurements of chipman and Longstroth (Proc. Trans. Nova Scotian Inst. Sci. 17, 175-84 (1929) an estimate is made of the percentage of water frozen at temperatures down to -20° in samples of muscle from different species of fish. If such measurements are to be used for the estimation of water, it must be known what portion of the water is kept from freezing by any inorganic salts that are present. Heat capacity measurements on a 1.7% sodium chloride solution are given, and are shown to agree well with values calculated from available thermal data with the aid of the freezing point curve. Heat capacity curves for dry gelatin and 20, 40 and 60% gels are given: X = (aHg + (1 - a)Hi - Hobs.)/(Hi - Hx), where a = wt. of dry gelatin where X = g.H_2O, Hg the heat capacity of dry gelatin, Hi = heat capacity of ice.

C. A. 26, 5476 (1932).

(1115) Merriman, H., "Brine Fog Quick Freezes Without Extreme Temperature." Food Industries 4, No. 12, 396-8 (1932). - Details of "Z" process; three factors considered by M. Zarotscheneff in development of process; chart showing time required for quick freezing fish or meat in direct contact with fog or brine; for comparison, freezing periods with air as medium

are given.

E. I. 1932, 1110.

(1116) Meyer, E. C., "Essentials of Farm Type Frozen Food Cabinet." Agric. Eng. 24, No. 3, 84-5 (1943).

(1117) Miller, E., Frozen Foods From Freezer Lockers. Utah Ag. Ext. N. S. No. 116, 1942.

(1118) Miller, H. G., "Direct Expansion Quick Freezing Machine." Ice and Refrig. 79, No. 2, 128-9 (1930). - Device which inventors claim possess qualities entirely foreign to any other quick freezing system; initial cost is low; minimum floor space required; temperature can be raised or lowered in very short time; minimum labor expense; ease of operation.

E. I. 1930, 1496.

(1119) Miller, I. C., "Quick Freezing Thaws Channels of Distribution." Food Ind. 10, 199-202 (1938). - History and development of quick freezing and its role in giving wider distribution to many fruits and vegetables.

F. F.

(1120) Miller, I. C., "Transporting Frozen Foods." Food Ind. 10, 385-6,417 (1938). - Frozen foods transported by railroads and trucks in refrigerated cars. Problems arise when less than carload lots are shipped, as in sample lots.

F. F.

(1121) Miller, I. C., "Chip Steak Creates Acceptance for Quick Frozen Meat." Food Industries 12, No. 7, 64-5 (1940). - Process for manufacturing chip steaks from beef; freezing method illustrated and described.

E. I. 1940, 1024.

(1122) Mills, J I., "The Vitamin C Content of Sheep-Liver; with Observations on the Effects of Freezing and Storage." Biochem. J. 26, No. 3, 704-11 (1932) - Sheep-liver contained an appreciable amount of vitamin C. It lost considerable activity by freezing and thawing, either rapid or slow, and by storage at 19° for six months.

B. A. 9, 319 (1935).

(1123) Mills, P. A., "Sampling Cold Pack Fruit." J. Assoc. Official Agri. Chem. 26, 335-9 (1943). - A large hollow trier, two inches in diameter and thirty inches long, with large saw teeth cut into one end, was designed for sampling material in the frozen state; From preliminary work carried out with this trier, it would seem that strawberries and blackberries continue to ripen during freezing and possible during subsequent storage. It is suggested that the work be repeated and continued with a similar trier made of stainless steel, one inch in diameter and forty inches long.

C. A. 37, 6049 (1943).

(1124) Mitchell, T., "Efficient System of Quick Freezing." Refrig. Eng. 41, No. 2, 101-2, (1941). - Brief notes on "Frick Freezing Systems"; system comprises well insulated space with cooling coils in bunker at top and push trucks, conveyors, or shelf coils below; motor driven fans keep moderate circulation of very cold air over foods to be frozen and back through cooling coils; any temperature desired down to -80° F. or even lower can be maintained.

E. I. 1941, 1026.

(1125) Mitchell, T., "Quick Freezing of Foods at Low Temperatures." Power 88, No. 3, 183 (1944). - Description of operation of low temperature, air blast method of refrigeration.

E. I. 1944, 889.

(1126) Mitchell, T. M. E., "Storage Houses Serve Frozen Food Trade." Food Packer 26, No. 8, 36 (1945). - Describes the community refrigeration center and the extent to which some units in this field have already organized service for quick frozen foods.

B. J. W.

(1127) Mitchell, T., "Quick-Freezing of Foods in Locker-Room Service." Power 89, 196 (1945). - A description of the frozen food locker plant including lockers, and quick freezing, aging, chilling and processing rooms involving three temperature levels. The article discusses the best type of refrigeration to use, the ultimate type of freezer, completely automatic cooling equipment and other factors to be considered in operation a locker plant.

E. M. F.

(1128) Montfort, P. T., "Equipment for Freezing and Storing Foods on Farms." Refrig. Eng. 42, No. 3, 162-72, 192 (1941).

(1129) Montfort, P. T., "Freezing and Storing Food on Farms." Agric. Eng. 23, No. 3, 88-90 (1942); J. of Arch. Eng. & Indust. 4, No. 3, 16-20 (1942).

(1130) Montroft, P. T., "The Relation Between Compressor Size, Insulation Thickness, and Eutectic Values in Farm Freezer Cabinets." Agric. Eng. 24, No. 12, 429-30, 432 (1943). - Analyses of heat losses and cost of operation of boxes with different amounts of insulation, also refrigeration required with certain loading with and without use of eutectic tanks.

E. B.

(1131) Moon, H. H., Caldwell, J. S., and Lutz, J. M., "Peas for Freezing - A Study of Suitability for Freezing Purposes of 18 Varieties of Peas Grown Under Eastern Conditions." Canner 83, No 4, 7-8, 11-4; No. 5, 13-16 (1936).

(1132) Moon, H. H., Caldwell, J. S., Lutz, J. M., and Culpepper, C. W., "Comparative Suitability for Freezing Purposes of 14 Varieties of Garden or Snapbeans Grown under Eastern Conditions." Canning Age 17, 271-5 (1936).

(1133) Moon, H. H., Smart, H. F., and Caldwell, J. S., "Varietal Suitability of Culivated Highbush Blueberries for Freezing in Consumer Packages." Fruit Prod. J. 15, 229-31, 248, 251 (1936). - Comparation studies of eight methods of freezing preparation and treatment upon several varieties of highbush blueberries. Best preservation obtained with better varieties of largefruited berries when packed in 50% sugar syrup and stored at 15° F.

F. F.

(1134) Moran, T., "Science and the Future of the Frozen Meat Industry." Brit. Cold Storage and Ice Assn. 22, No. 2, 89-104, 105-111 (1925-26). - Notes on chilling and freezing; concludes that any great improvements will only result from complete understanding of structure of muscle, particularly of how water in it is held, its post-mortem changes, and various physical changes which take place during freezing and thawing cycle.

E. I. 1926, 635.

(1135) Moran, T., "The Science of Meat Freezing." Cold Storage 29, No. 336, 114-16 (1926). - Results of research.

E. I. 1926, 635.

(1136) Moran, T., "The Freezing of Gelatine Gel" Proc. Roy. Soc. London 112A, 30-46 (1926). - "I. The freezing rate and gel concentration determines (a) the disposition of the ice in the frozen gel, (b) the extent of structural deformation in the gel. II. When the gels above a concentration of 12% are frozen slowly, there is a clear cut separation into ice and more concentrated gel, and the concentration of the latter is determined by the temperature. III. The existence of this phase equilibrium between ice and gel has been used to determine the state of the water in iso-electric and acid gels."

E. M. F.

(1137) Moran, T , "The Science of Meat Freezing." Refrigerating Eng. 12, 343-4 (1926). - Lack of uniformity in methods and degrees of freezing extend throughout the world. In Germany and the Continent the average freezing temperature may be 21.2° F.; Australasia 12.2° F.; America -4.0° F., whereas this may be followed by storage at 14° F. Plank's results show that beef frozen at 29.3° F. contains only 42.1% of the water in the form of ice while at -67° F. 100% of the total water has been transformed into ice. Slow thawing of the frozen meat reduces drip. Rapid freezing of the hind quarters of beef totally in 30 minutes requires a temperature of -240° C. according to Plank's formula. Appreciation of the lack of knowledge concerning the mechanics of freezing and thawing in flesh and tissue is expressed.

C. A. 20, 2710 (1926).

(1138) Moran, T. and Vickery, J. R. The Preservation and Transport of Frozen and Chilled Beef. Proceedings 5th International Congress of Refrigeration, 1928, page 54.

(1139) Moran, T., "Recent Advances in the Low Temperature Preservation of Foodstuffs." J. Soc. Chem. Ind. 48, 245-51T (1929).

(1140) Moran, T., "Rapid Freezing. Critical Rate of Cooling." J. Soc. Chem. Ind. 51, 16-20T (1932). - The basis of rapid freezing being taken as a purely physical one of small crystal formation, these experiments show that the limiting cooling rate is fixed by the condition that the time to cool and freeze semitendinosus muscle from + 5 to -5° should be in the range 32 to 48 minutes. Brine at -10° and -20° and solid carbon dioxide and ether at -70° were used as a cooling media. The range of + 5 to -5° was chosen, because at the latter temperature 82% of the water in muscle is frozen. An insulated box is described having one face adapted for a freezing surface. With 5% gelatin in this box, a white opague layer of rapidly frozen gel is firm, continuous and resilient; beyond this is a transparent slowly frozen gel fractured by large ice crystals. The division is sharp, and the thickness of the rapidly frozen layer is easily measured. With frozen muscle there is a 2-3 mm. layer of intensely yellow color, then a 2-cm. zone of yellow-pink rapidly merging into bright red. The color is dependent on the size of the ice crystals, and for good rapid freezing the lighter color should be obtained. It is shown that the limiting diameter for a cardboard cylinder to yield a cooling time within the range must be about 2.5 in.

C. A. 26, 2252 (1932).

(1141) Moran, T. and Hale, H. P., "Rapid Freezing. Temperature of Storage." J. Soc. Chem. Ind. 51, 20-3T (1932). - For best results, rapidly frozen foodstuffs should be stored at about -20°. Tests were made with semitendinosus muscle rapidly frozen in rectangular tin containers with several layers of filter papers in the bottom separated from the muscle by a perforated mat. Storage was maintained at -20° ± .1°, and samples taken at various times were thawed at the same rate by immersion in brines of gradually increased temperature until finally left at 8° for twenty-four hours. The free drip from the muscle during thawing was absorbed by the filter papers. The muscle pressed under a weight of 0.74 gm per sq. cm. of meat then furnished a net drip which was an index of the change in the colloidal state of the muscle. Storage at various higher temperatures shows that at -3° a marked change occurs within 2 days. The curve connecting drip and temperature of storage passes through a maximum at a temperature somewhat below the f. p. of muscle. Analysis of the drip indicates that all or part of the increased drip at higher temperatures of storage is due to a relatively greater loss of water from the meat. Marked growth in ice-crystal size occurs during storage at higher temperatures, the crystals rounding off in a manner suggesting a surface tension effect.

C. A. 26, 2252 (1932).

(1142) Moran, T., "Latest Phase of Meat Freezing Research." Brit. Assn. Refrig. - Proc. 29, No. 2, 97-107, 108-20 (1932-33). - Isolation of myosine; properties of frozen meat depending upon temperature of storage. Cf. Ice & Cold Storage 36, No. 422, 75-7 (1933); Cold Storage 36, No. 421, 85-6 (1933).

E. I. 1933, 960.

(1143) Moran, T., "Data on Meat-Freezing Phenomena." Ice and Cold Storage 36, 75-7 (1933). - Biochemical changes to which frozen meat is subjected during freezing and storage are discussed.

C. A. 27, 4317 (1933).

(1144) Moran, T., "Bound Water and Phase Equilibrium in Protein Systems; Egg Albumin and Muscle." Proc. Roy. Soc. London 118B, 548-9 (1935). - "The bound water of native egg albumin and egg albumin denatured by heat and by urea has been determined at different activities of water from observations on the equilibrium in the frozen state and under an applied pressure. The chemically bound water of the two proteins is approximately the same (0.26 grams per gram of protein), but the water held more loosely at high activities is less in the denatured protein. Measurements have been made of the water content of muscle in equilibrium with ice at different temperatures and activities of water. The eutectic temperature of muscle is approximately -37.5° C. The bound water of muscle is small and at intermediate and high activities of water is of the order of 0.40 gm. per gm. of dry solid."

E. M. F.

(1145) Moran, T., "Post-mortem and Refrigeration Changes in Meat." Soc. Chem. Ind. J. 54, 149T-51T (1935). - This paper discusses the changes which meat undergoes "post-mortem" that can be controlled to a very great extent by the conditions of storage, including regulating temperature, humidity, and the gaseous environment. The best example of this control is storage in the frozen state at -7° to -10° since at these temperatures attack by bacteria, yeasts, and molds is impossible, or extremely slow. The result being that many frozen meats are edible and wholesome after storage for months or even years.

E. M. F.

(1146) Moran, T. and Wright, N. L., "Store Burn in Frozen Meat and Poultry." Food Mfg. 12, 344-5 (1937).

(1147) Moran, T., "Freezing and Cold Storage of Herring." Refrig. Eng. 34, 306 (1937). - The paper describes how storage of fish for periods up to six months, to supply fish of good quality throughout the year can be successfully carried out by means of rapid freezing, followed by glazing with a shell of ice and cold storage of temperatures as low as -28° C. It describes what is known of the causes of rancification in the herring, during storage, and some of the conditions under which it is accelerated or retarded during cold storage.

E. M. F.

(1148) Moran, T., "Gas Storage of Meat and Eggs." Food Res. 3, 149-54 (1938). - A CO_2 content of 215% with humidity 80% and temperature 0° are optimum conditions for egg storage.

C. A. 32, 5947 (1938).

(1149) Morgan, A. F. and Field, A., "The Effect of Drying and of Sulfur Dioxide upon the Antiscorbutic Property of Fruits." J. Biol. Chem. 82, No. 3, 579-86 (1929). - Peaches of known origin, fresh, sun-dried and dehydrated, both sulfured and unsulfured were treated for vitamin C content. The sulfured peach products retained the full antiscorbutic vitamin content of the fresh fruit, but the unsulfured sun dried and dehydrated peaches retained no detectable amount of this property. The suggested possible relation of vitamin C protection to a minimum of sulfur dioxide content or acidity is now under investigation. The sulfured dried peach preparations were found

to rank with orange juice, raw tomatoes, and other highly potent anti-scorbutic foods.

B. A. 4, 1067 (1930).

(1150) Morgan, A. F., Langston, F. C., and Field, A., "Effect of Carbon Dioxide and Sodium Benzoate on Vitamin C Content of Orange Juice." Indust. and Eng. Chem. 25, No. 10, 1174-6 (1933). - Among other things it mentions that no difference in vitamin C value between valencia and naval oranges was observed and prolonged frozen storage did not lessen it. Orange juice preserved by 0.1% sodium benzoate or by pasteurization and bottling with carbon dioxide under pressure lost none of its vitamin C.

B. A. 9, 319 (1935).

(1151) Morris, T. N., "Changes in the Pectic Substances of Fruits During Storage." Dept. Sci. & Indust. Res. Rept. Food Invest. Bd. 1933, 155-61, (1934). - The pectin of raspberries loses 15-25% of its setting power in four months' storage at -10°, and that of gooseberries about 35% under similar conditions; no change occurs at -20°, however. Addition of H_2SO_3 to the fruit before extration greatly toughens the skin and destroys the pectin, but if the fruit is heated and then cooled before addition of H_2SO_3, the setting value after four months was actually increased. This is due principally to improved extration of the pectin rather than to any change in the pectin itself. Sucrose added to the berries is slowly inverted during freezing, 47% if the sucrose added to raspberries being inverted in eight months at -10°.

C. A. 29, 241-2 (1935).

(1152) Morris, T. N., "Freezing and Storage of Soft Fruits and Its Relation to Subsequent Processing." Ice & Refrig. 90, No. 3, 215-6 (1936). - Rate of chemical change increases as temperature rises; variation in behavior of fruits; exclusion of air and use of inert gases; use of heat for preservation of fruits; small units for freezing material. Before Brit. Assn. Refrig.

E. I. 1936, 954.

(1153) Morris, T. N. and Barker, J., "The Freezing of Fruits." Dept. Sci. and Indust Res. Ann. Rept 1938, 190-91 (1939). - Reports that after storage in cartons at -20° C. for four months, strawberries frozen by direct immersion in a syrup at -20° C. were superior to those frozen more slowly (in tins immersed in -20° C. brine or in cartons in air at -20° C.). Slow freezing in air at -5° C gave the poorest products. Samples stored at -10° C. were inferior to those stored at -20° C. Excellent results were obtained by freezing and storing strawberries crushed with sugar at -20° C. or by stirring dry, powdered sugar into sliced strawberries and allowing it to dissolve or covering with strong syrup, these products being used in ice creams, for dessert or flavoring, etc.

B. A. 16, 224 (1942).

(1154) Morris, T. N. and Barker, J., "The Freezing of Vegetables." Dept. Sci. and Indust. Res. Ann. Rept. 1938, 209-10 (1939). - The effects of freezing by (1) direct immersion in sodium chloride brine at -20° C. (cooling time 0.017), (2) freezing in tins immersed in brine at -20° C. (cooling time 0.5), (3) methods taking cooling times of 4.2 and 9.7 and (4) slow freezing (cooling time 23.7) on the quality of peas and asparagus after

four months storage at -20° and -10° are discussed. Storage at -20° was found preferable to storage at -10° C.. Experiments on the preparation and freezing of spinach are reported.

E. M. F.

(1155) Morrison, G., "Superior Varieties of Lima Beans and Snap Beans for the Quick Frozen Pack." Quick Frozen Foods 1, No. 11, 16-18 (1939).

(1156) Morrison, W. L., "Some Basic Differences Between Home Freezers and Locker Plants." Refrig. Eng. 49, No. 4, 273-4 (1945). - Discussion of home freezers and how they differ in use from community locker plants with special reference to storage of quick moving items and small quantities rather than large bulks - special reference is also given the part frozen cooked foods play in this general plan. Freezing as well as storage may be accomplished in home units.

F. F.

(1157) Mosloff, H., "Organization and Economic Growth of the Frozen Foods Industry in Germany." Zeit fuer die Gesamte Kaelte-Industrie 47, No. 11, 167-70 (1940). - Organization and economic growth of frozen food industry in Germany; short historical review of development and account of present status of industry.

E. I. 1941, 1026.

(1158) Mount, W. D., "Dry Ice in Distribution of Frozen Foods." Refrig. Eng. 23, No. 6, 353 (1932). - Increasing popularity of dry ice in frozen-food transportation; simplicity of cold storage by means of solid carbon dioxide.

E. I. 1932, 1111.

(1159) Moyer, J. C. The Thiamin Content of Vegetables. Ph.D. Thesis, Cornel University, Feb. 1942.

(1160) Moyer, and Tressler, D. K., "Determination of Thiamine in Vegetables." Ind. Eng. Chem, Anal. Ed. 14, 788-90 (1942). - The thiamine content of eight frozen vegetables was determined by the bioassay, thiochrome and fermentation methods. When the sulfite cleavage modification of the fermentation method was used, the results with three of the vegetables agreed. The other vegetables gave somewhat higher values by the bioassay method, possibly because the animal diet was incomplete in other factors.

C. A. 37, 193 (1943).

(1161) Moyer, J. C. and Tressler, D. K., "Thiamine Content of Fresh and Frozen Vegetables." Food Res. 8, No. 1, 58-61 (1943). - Thiamine losses during processing were 16-20% for asparagus and 5-25% in peas , the greater loss occurring at the end of the season. Peas may be held for some time at room temperature without any destruction of thiamin, and both vegetables stored for seven and five months at -21, -22, and -40° C. showed no significant loss.

B. A. 17, 1656 (1943).

(1162) Moyer, J. C. and Stotz, E., "The Electronic Blanching of Vegetables." Science 102, No. 2638, 68-69 (1945). - An oscillator having an output of 750 Watts at 150 megacycles was employed. Electronic blanching of cabbage gives small loss of ascorbic acid in contrast to the 30% or 40% losses occurring in the steam and hot water processes, thus providing processed vegetables of higher nutritive value.

B. A. 20, 187 (1946).

(1163) Muenchow, A. F., "How to Grade Peas for Quick Freezing." Western Canner and Packer 33, No. 4, 41-3 (1941).

(1164) Munson, J. E., "Sugar Frozen Packaged Fish from Florida." Ice & Refrig. 81, No. 4, 242-44 (1931). - Refrigerating equipment of Indian River Fisheries, Inc., plant at Sebastian, Fla.; construction of freezer; routing products through plant; special refrigerating equipment; special super-freezer meets many and varied conditions required in process.

E. I. 1931, 311.

(1165) Murayama, T., "Progress of the Frozen Food Industry in Japan." Engineering 142, No. 6, 517 (1936). - Survey of history and development of the refrigerating industry in Japan; preservation of fish encouraged by Japanese government; adoption of quick freezing system and use of only fresh fish; investigation work in progress in Japan on freezing of eggs, poultry, vegetables, and fruits; strawberries and melons successfully frozen.

W. B. C.

(1166) Murayama, T., "Frozen Foods in Japan." Ice & Cold Storage 39, No. 460, 97-8 (1936). - Review of developments and improvements in quick freezing of food products; including fish roducts; brine systems; convection systems; freezing facilities; transport. Before Chem. Eng. Congress of World Power Conference.

E. I. 1937, 980.

(1167) Murray, H. C. and Stratton, R., "Vitamin C Content of Wild Greens." J. Nutrition 28, 427-30 (1944). - Vitamin C assay of fresh, cooked and frozen samples of edible wild greens showed that pokeweed, tall dock and curly dock contained twice as much vitamin C as spinach; poverty weed, shepherds purse and lambs quarter, about as much as spinach; checkweed, dandelions, and prickley lettuce, considerably less than spinach. Loss of vitamin C in wild greens due to freezing or cooking was comparable to the loss sustained under similar conditions for cultivated greens. There was some evidence that the vitamin C was greater in plants exposed to full sunlight and in fertile, uncultivated soil.

C. A. 39, 1234 (1945).

(1168) Murray, W., "The Adoption of a Standard International Method of Inspection of All Frozen Produce." Refrig. Eng. 12, 217-19 (1926). - Considers the advisability and practibility of the standardization and adoption of inspection of frozen produce. Discusses the meat and dairy products inspection methods used in different countries with emphasis on the government system of inspection of the Dominion of New Zealand Recommends a synchronization of the various methods and standards now in force; a complete and official recognition by all consuming countries of the standards

agreed upon; the recognition and acceptance by all consuming countries of the certificate as to inspection issued by the Governments of the various countries of orgin; and that the only inspection necessary at point of distribution be an inspection as to the produce being in proper order and condition for human consumption. The need for standardization of inspection is stressed. No actual standards or methods of inspection are given.

W. B. C.

(1169) Murri, I K. and Kudryautzeva, A. V., "The Influence of Treating Berries and Fruits on the Potency of the Antiscurvy Vitamin." Bull. App. Botany, Genetics, Plant Breeding Suppl. 67, 71-88 (1934).- The juice of cranberries has a lower vitamin content that the whole berry. Dried cranberries - under a vacuum at 35° - were equal in potency to the juice. Precipitation of pectins had no effect on vitamin C. SO_2 treatment of black currant juice or keeping it at 10° did not reduce its vitamin activity. Pasteurization of currant juice caused a 25% loss in vitamin potency. Blackberries were found to be a poor source of vitamin C and blueberries - fair.

C. A. 28, 7317 (1934).

(1170) Nelson, A.I., Nickerson, J.T.R. and Evers, C.F. "Research on Production Basis." Food Indust. 16, 432-4 (1944). - A description of a miniature Birdseye factory (pilot plant), with machines one-eighth the size of production units, permitting research under factory conditions. Problems inherent in quick freezing, from the time that the raw product is delivered to the factory until the finished product is in the package will find their solution in this tiny, controllable processing plant.

E. M. F.

(1171) Nelson, E.M. and Mottern, H.H. "Vitamin C Content of Frozen Orange Juice." Indust. and Eng. Chem. 25, No. 2, 216-18 (1933). - Orange juice that has been frozen quickly and melted at room temperature shows no significant loss of Vitamin C. Under the conditions of this experiment there is no apparent advantage from the standpoint of vitamin C preservation in excluding atmospheric oxygen during the freezing process. Three preparations of orange juice, frozen respectively in air, nitrogen, and oxygen, and stored with the same gas in hermetically sealed containers at 0° F. (-17.8° C.) for ten months all showed approximately the same vitamin C potency as fresh orange juice. Data concerning the use of 2-6 dichlorophenolindophenol as an index of vitamin C potency are presented and discussed.

B.A. 7, 2115 (1933).

(1172) Nelson, P.R. and Lang, C.W. "Glass Containers for Frozen Fruit Products." Food Indust. 2, No. 4, 184-5 (1930). - Glass Container Association has conducted preliminary experiments on heat transfer in glass and associated problems; curves giving results of heat transfer of frozen products.

E.I. 1930, 835.

(1173) Nestler, R.B. and Nelson, A.L. "The Industrial Aspects of Pheasant and Quail Propagation in North America for 1939-40." Trans. N.A. Wild-Life Conf. 1939-40 7, 115-30 (1942). - A discussion of pheasants and quail raising in which it is mentioned that in one state quick-freezing preservation of the birds is being inaugurated.

B.A. 17, 1379 (1943).

(1174) Newton, J.A. "Air-flow Freezing of Fruits and Vegetables." Refrig. Eng. 35, No. 5, 329-360 (1938). - Embodying new principle worked out by R.P. Melhart, addition recently made to freezing and storage sections of Washington Packers' Plant at Puyallup, Wash.; prior to this construction, general practice called for cold blast travelling lengthwise of food belt, requiring centralized blower; Melhart method sends blasts vertically through belt, permitting utilization of several diffusers along length of belt.

E.I. 1938, 1023.

(1175) Nicholas, J.E. "Performance of Domestic Frozen Food Cabinets." Agric. Eng. 23, No. 7, 232 (1942).

(1176) Nicholas, J.E. and Olson, G. "Seasonal Loading and Freezing Rates of Domestic Frozen Food Cabinets." Agric. Eng. 25, No. 5, 169-72 (1944). - Studies on preparation for freezing, rate of freezing, and the testing of foods for palatability.

B.A. 18, 2020 (1944).

(1178) Nicholas, J.E. Proper Preparation of Foods Speeds Freezing and Lightens Load on Unit. Pennsylvania State College, School of Agriculture, Agriculture Experiment Station Bulletin 464, Supplement No. 2, 1945. Page 2. - A review on quick freezing and packaging aspects.

B.H.W.

(1179) Nicholas, J.E. "Quick Freezing Performance of an Experimental Sub-Zero Food Freezer." Refrig. Eng. 50, No. 1, 29-31, 57-8, 62 (1945). - General discussion of food freezing--quick and sharp defined. Experimental unit presented which can be used for several types of freezing procedures. Data, diagrams and graphs showing variations and comparisons of freezing methods. Fresh tomatoes frozen in the experimental freezer were satisfactory for slicing--these were hot house tomatoes. Other foods were also tested for freezing methods. Cf. Canner 101, No. 10, pp. 15-16, 18-19.

F.F.

(1180) Nichols, P.F. "Cold Packing of Small Fruits Looms Larger in the Industry." Food Indust. 1, 252-5 (1929). - Data on extent of business; general methods of cold packing.

E.I. 1929, 797.

(1181) Nickerson, A.L. "Limited Pack Brine Frozen Lobsters." Can Fisherman 17, No. 7, 20 (1930).

(1182) Nickerson, J.F. "Carbon Dioxide Research Project." Oil Paint Drug Reptr. 135, No. 25, 5, 27 (1939). - Storage of foods such as meat, eggs, fruits, and vegetables, at low temperatures in an atmosphere containing CO_2 reduced spoilage and improved the quality of the stored food. However, more information is required as to the optimum concentration of CO_2 for each food. Once this is found, it can be maintained by devices now available. A co-operative investigation is being promoted.

C.A. 37, 6363 (1943).

(1183) Nickerson, J.T.R. and Fitzgerald, G.A. Problems Arising During Holding of Poultry Prior to Evisceration and Freezing. Proceedings 7th Worlds' Poultry Congress, pp. 505-509, 1939.

(1184) Nickerson, J.T.R., Fitzgerald, G.A. and Messer, R. "Health Problems in Packing Crustacean Products." Am. J. Public Health 29, 619-27 (1939). - Methods of controlling cooked frozen crustacean products: (1) pressure cooking, properly done, is excellent means of sterilization (2) internal in vivo chlorine treatment of crustaceans (3) chlorine as disinfectant in plant (4) sanitary control of all equipment--do not employ corroded utensils (5) training of workers--proper cleansing of hands.

It is important to note that boiling in salt water does not destroy all organisms and that boiling in chlorinated water is harmful to the flesh products. Experiments are reported on purification of crabs in vivo; the author concludes that pressure cooking is the best means of sterilization, but when this is not feasible, the purification plus water boiling may be used. Once the meat is sterilized, strict precautions must be exercised in order to prevent recontamination.

F.F.

(1185) Nickerson, J.T.R. "A Modified Little Plate Method for Bacterial Counts in Vegetable Freezing Plants." Food Res. 8, No. 2, 163-8 (1943). - The Frost little plate method for bacterial counts was modified as follows: special slides provided with a central elevated position of definite area were used; the incubation period of 4-8 hours recommended by Frost for little plate cultures was lengthened to 16 hours; the dried cultures were stained by first treating with 1% ferric sulfate solution washing, and then treating with a 0.5% solution of hematoxylin. Bacterial counts were made by standard Petri dish and modified little plate methods on the same sample of frozen vegetables, or samples from different packages and on different samples from the same package. Statistical analysis of the results indicated that the modified little plate method was approximately as precise as the standard Petri dish method.

B.A. 17, 2380 (1943).

(1186) Nielson, Campbell, and Boggs. "Tenderizing Vegetables for Freezing." Western Canner and Packer 35, No. 7, 49 (1943).

(1187) Nielson, Wolford, and Campbell. "Delay Affects Frozen Pea Quality." Western Canner and Packer 35, No. 7, 47,48 (1943).

(1188) Nielson, J.P. and Gleason, P.C. "Rapid Determination of Starch." Ind. and Eng. Chem. Anal. Ed. 17, No. 3, 131-4 (1945). - Presents factors for calculation of starch in vegetables using potato starch as a standard; compares results with those obtained by acid and enzymic hydrolysis methods; describes details of the method which is based on color development of iodine--method can be used with fresh, frozen and canned vegetables, and may be applied to dehydrated foods.

F.F.

(1189) Nilson, H.W. and Coulson, E.H. The Mineral Content of the Edible Portions of Some American Fishery Products. Investigational Report 41, United States Bureau of Fisheries, 1939.

(1190) Noble, I. and Hardy, F.M. "The Effect of Storage Time and Temperature Upon the Palatability of Pork Roasts Preserved by Freezing." J. Home Ec. 33, 597 (1941). - Taken from paper presented by authors before American Home Economics Association, 34th Annual Meeting. Experiments showed that in frozen pork, the desirability of the aroma, flavor of the fat and of the lean decreased at all storage temperatures tested (0, 10, and 15° F.), but quantity of juice, tenderness, and the storage and cooking losses did not change significantly. There was little variation according to temperature of storage. Freezing itself did not change any of these quality factors. F.F.

(1191) Noble, I. and Hardy, F. "Effect of Storage Temperature and Time Upon Quality of Pork Preserved by Freezing." Food Res. 10, No. 2, 165-75 (1945). - The rate of change in the palatibility of pork loin roasts frozen at -18° C. and stored at -18, -12, and -9° C. was determined by calculating the regression of judges' scores on storage time. The rates of change in 288 roasts, stored from 18 to 33 weeks, at different temperatures were not significantly different for any of the palatability factors. All of the coefficients for the desirability factors (flavors of fat and lean and aroma) but none for the intensity factors except for aroma, were statistically significant for the 18 week roasts. For the 33 week group, however, only the coefficient for desirability of the flavor of the exterior fat was significant.

B.A. 19, 2018 (1945).

(1192) Notevarp, O. and Heen, E. "Influence of Freezing Rates, etc. (on Quality of Frozen Product.") Zeit Fuer die Gesamte Kaelte-Industrie 47. No. 8, 122-6, No. 9, 140-2 (1940). - Influence of rate of freezing, storage temperature and degree of freshness of unfrozen fish on quality of frozen product; results of author's experiments carried out at Fish Research Laboratory, Bergen, Norway, show that fish must be absolutely fresh before freezing, and storage temperature is extremely important, but rate of freezing is of lesser importance. Bibliography.

E.I. 1941, 1025.

(1193) Novikova, I.I. "Modification of Fat in Frozen Pork Meat After Prolonged Storage." Kholodil' Naya Prom. 16, No. 4, 30-35 (1938). - If the meat is kept at -18°, there is no change in the fat over a period of one year. If stored at -8°, the fat undergoes chemical and organoleptic changes. The surface layer yellows (even in six months), acquires a stearic taste; in 1 year the phenomenon has penetrated to a depth of 0.25 to 0.40 cm. Frozen pork meat should therefore not be stored at -8° for more than 3 to 4 months.

C.A. 33, 8841 (1939).

(1194) Noyes, H.A. "Quick Freezing with Portable Units." Food Ind. 10, 678-9 (1938). - "Z pack freezing unit operating on four kinds of berries gives flexible and efficient service to packer."

F.F.

(1195) Oestert, E. "New Research on the Conserving of Meat by the Ottesen Freezing Process." Zeit Fuer die Gesamte Kaelte-Industrie 34, No. 5, 84-88 (1927). - Ottesen glycerine-brine process of meat freezing; method of combating surface discoloration of frozen meat by means of harmless addition of ammonia or some other alkali; results of tests: see translated abstract in Information on Refrigeration Monthly Bulletin No. 8, 1927. pp. 756-760.

E.I. 1927, 693.

(1196) Oliver, A.W. Freezing and Storing of Meat, Poultry, and Eggs. Oregon Agricultural Experiment Station Extension Circular 373, 1941.

(1197) Olsen, I.T. "Wetting Agents Speed Chemical Peeling." Food Ind. 13, No. 4, 51-2 (1941). - Present methods of peeling peaches for preservation by quick freezing; addition of small amounts of wetting agent to both acid and lye solutions greatly reduces time necessary for peeling; everything else being equal, time required for peeling peaches in lye bath was about half that required in acid bath; hydrochloric and sulfuric acids seemed to be most effective; conclusions reached.

E.I. 1941, 474.

(1198) O'Mahony, W.W. "Rapid Freezing of Food Products." Ice and Cold Storage 32, No. 374, 111-3 (1929). - Brine-pulverization process has been invented and industrialized by M.T. Zarotschenzeff; its essential feature is pulverization of liquid, water, brine, etc., which entirely fills freezing chamber with thick mist of microscopic drops; this frigorific fog is obtained by action of special Zarotschenzeff pulverizers; claims of process as investigated at Paris-Vangirard, are set forth.

E.I. 2, 1574 (1939).

(1199) Oman, D.E., "Frozen Foods Will Hit a New High in 1943." Fruit Prod. J. 22, No. 1, 344-5 (1943). - Production will be increased by about 60%.

B.A. 18, 264 (1944).

(1200) Onokhova, N.P. "The Effect of Freezing and Processing on the Retention of Vitamin C in Vegetables and Fruits." Bull. Applied Biol. (USSR) Vitamin Problems Suppl. 84, No. 2, 247-54 (1937). - At -8° C. for 3 months cranberries lose some of their antiscorbutic potency. Horseradish and potatoes at the same temperature retain their Vitamin C. Vitamin C of cranberries is not decreased by freezing them at -26° C. and storing them at -8° C. Freezing and thawing cause a loss of vitamin. Thawing cranberries before cooking or cooking without preliminary thawing has no effect on the Vitamin C content. Potatoes lose some of the vitamin even without thawing and if they are thawed they lose very much more. The apple Antonovka, when dried at 60°, loses some Vitamin C; about two thirds is retained.

C.A. 33, 1405 (1939).

(1201) Oser, B.L. "Methods for Vitamin Control of Processed Foods." Proc. Inst. Food Technologists 1942, 59-60 (1942). - Among other things there is a discussion of "the more recent chemical, physical and microbiological methods for the determination of thiamine, riboflavin, ascorbic acid, nicotinic acid, and vitamin A in foods". These are described and their advantages and limitations given.

B.A. 19, 1650 (1943).

(1202) Overholser, E.L. and Cruess, W.V. A Study of the Darkening of Apple Tissue. Calif. Agr. Expt. Station Technical Paper 7, 1923.

(1203) Overholser, E.L. "Preservation of Quickly Perishable Fruits and Vegetables." Refrig. W. 60, 25-6 (1925). - Preserved by freezing in sugar solution.

F. F.

(1204) Overholser, E.L., Berry, J.A., Diehl, H.C., Boggs, M. and Todhunter, E.N. Locker Freezing of Fruits and Vegetables. State Col. of Washington Agricultural Experiment Station Popular Bulletin 161, 1942. 34 pages.

(1205) Pace, H. L., "Quick Freezing of Florida Shrimp." Ice & Refrig. 86, No. 2, 119-21 (1934). - Description of process used in Florida freezing plants to pack shrimp by quick-freezing process.

E. I. 1934, 930.

(1206) Paech, K., "Comparison of Methods of Freezing Foods." Food Indust. 9, 528 (1937). - Article is digest of article appearing in Chemiker Zeit. 61, 537, 1937; "Comparative Studies of the Freezing of Fruits and Vegetables." Heckermann process (freezing in a rapid current of chilled air and storing between refrigerating coils), Birdseye process, and freezing in still air in open containers were three methods compared. No one process appeared superior for all purposes.

F. F.

(1207) Paech, K., "The Significance of Reducing Substances in the Evaluation of the Quality of Frozen Fruits and Vegetables." Zt. Kaelte-Indust. 46, No. 1, 7-11 (1939). - Relation between reducing substances and aftertaste in frozen fruits and vegetables.

E. B.

(1208) Paech, K., "Biological Aspect of the Preservation of Freshness of Food Through Refrigeration." Angrew. Chem. 53, No. 13/14, 149 (1940). - Stirring before freezing destroys harmful enzymes.

B. A. 16, 1209 (1942).

(1209) Paech, K., "The Freezing of Fruit Juices." Angrew. Chem. 53, No. 13/14, 149 (1940). - Tomato, apple, cherry and pineapple juices are particularly suited for freezing. Juices containing pectin may gel and not reliquefy on warming.

B. A. 16, 1209 (1942).

(1210) Paech, K. and Laeser, E. The Freezing Preservation of Vegetables, Fruit and Fruit Juice. Berlin: P. Parey, 1941. - Biological principles as related to preparation for freezing preservation in general practice.

C. A. 37, 2094 (1943).

(1211) Panasenko, V. T. and Tatarenko, E. S., "Cold Resistant Molds of Food Products." Microbiology (U. S. S. R.) 9, 579-84, 584 (1940). - In refrigerating rooms with a temperature of -4.5° C., forty species and over one hundred twenty strains of molds were isolated from the walls, ceiling, containers, and sometimes from the stored foodstuffs. Penicillium was prevalent. The molds spread from adjoining rooms. A 0.5% acetic acid solution is most effective for control of molds, but it cannot be used on lime-containing stucco plaster.

C. A. 35, 4105 (1941).

(1212) Pankoffer, J., "Influence of Rate of Freezing on the Quality of Fruit and Vegetables." Zeit Fuer Die Gesamte Kaelte-Industrie 47, No. 11, 170-4 (1940). - Influence of rate of freezing on quality of fruits and vegetables; account of author's practical experiences; means of increasing rate of freezing by precooling; illustrated description of German plant and methods of sorting, packing, storing, etc., employed.

E. I. 1941, 1025.

(1213) Paris, P., "Packing Tests Especially on Materials for Packing Frozen Articles." Papier Ztg. 67, 198-9, 438 (1942). - The most important requirements for a material to be used for packing frozen articles are: very low permeability to water vapor and air; good resistance to water, acids and oil; freedom from taste and odor; and high wet burst strength. The principal test methods are discussed.

C. A. 38, 4341 (1944).
C. Z. I, 1947 (1943).

(1214) Parkerson, W., "Sizing Freon Refrigerant Lines." Heating & Vent. 39, Nos. 3, 4, 5, 217-222 (1942).

(1215) Parks, C. T., "Prevention of Curd in Grapefruit Juice." Fruit Prod. Jour. 19, No. 7, 210-11, 215 (1940). - (Among other things the abstract discusses enzyme activity.) The enzymes can be inactivated by heat but higher temperatures than those necessary for pasteurization are required. Flash heating to 190° F., kettle heating to 185° F. or heating for fifteen minutes to 180° F. in the can is sufficient to pasteurize and also prevent curd formation. Grapefruit juice prepared by these methods had excellent quality in all respects.

B. A. 16, 1209 (1942).

(1216) Pasteur, H. W., "Methods of Refrigeration." Brit. Assn. Refrig. - Proc. 30, No. 2, 33-48 (1933-34). - Survey touching on some of many different branches and methods of refrigeration of food; cooperation between refrigerating and chemical concerns; principles of refrigeration; refrigeration of meat, bacon, eggs, fruit, milk, butter, and ice cream; quick freezing, domestic refrigeration.

E. I. 1934, 931.

(1217) Pasteur, H. W., "Methods of Refrigeration." Chem. Age (London) F'3 30, 96-7 (1934). - Air cooling by forced circulation over cooling batteries; warm meat brought directly into chilling room; discussion of gas storage.

W. B. C.

(1218) Pattison, E. S., "Freezing Fish by the Birdseye System." Food Ind. 2, No. 4, 159-161 (1930). - Cleaning, filleting, packaging and quick freezing of fish at plant of General Seafoods Corp.; description of Birdseye system of operation.

E. I. 1930, 1499.

(1219) Paul, P. and Childs, A., "Effect of Freezing and Thawing Beef Muscle Upon Press Fluid, Losses and Tenderness." Food Research 2, 339-47 (1937). - Conclusions: unfrozen beef has a significantly lower total loss than frozen beef. Frozen beef thawed at 24-25° at a relative humidity of 65% gains weight rather than losing it by evaporation as does frozen beef thawed at 175°. Thawing temperature does not affect the press fluid content of frozen beef. Total moisture, drip and tenderness of cooked beef are unaffected by freezing or by different thawing temperatures.

C. A. 32, 1001 (1938).

(1220) Peak, W. H., "Quick Freezing of Fruits and Berries." Cold Storage Produce Rev. 41, 316 (1938). - A brief review of processes.

C. A. 33, 1053 (1939).

(1221) Pecori, G., "Value of Rational Thawing of Frozen Meats for Food." Ann Igiene 36, No. 1, 39-52 (1926) - When thawed too rapidly, and at too high temperature meat becomes unattractive in appearance, viscous, and less digestible, as shown by tests in vitro. There is also a greater exudate of liquid in the rapidly thawed meat, resulting in a loss of about 0.6% of the albumin. The continued loss of liquid may amount to 10% of the weight before the meat is finally consumed. There is no appreciable change in chemical composition. To avoid the disadvantages of rapid thawing, it is recommended that the frozen meat be thawed slowly, not above 8-10° C., in a well-aired place, and kept at a nearly constant temperature for three to four days before placing it on sale.

B. A. 2, 493 (1928).

(1222) Pellissier, C. E., "New Freezing Service by Brooklyn Bridge Freezing and Cold Storage Co." Ice & Refrig. 93, No. 6, 451-3 (1937). - Wrapping, packaging and sorting fillets; sorting and packing shrimp; future of fishing industry lies in frozen packaged products; description of freezing and packing process.

E. I. 1928, 1023.

(1223) Pellissier, C. E., "Quick Freezing Builds Greater Sea Food Sales." Ice & Refrig. 94, No. 6, 454-6 (1938). - Description of development of frozen oyster business by Bluepoints Oyster Co., subsidiary of General Foods Corp; packaging and freezing process; additional research planned.

E. I. 1938, 1023.

(1224) Pellissier, C. E., "Frozen Sea Foods." Ice & Refrig. 99, 66-8 (1940). - Increase in consumer acceptance of frozen seafoods partially due to introduction of quick freezing but more generally caused by selection of higher quality foods for freezing and better packaging.

F. F.

(1225) Pennington, M. E. The Comparative Rate of Decomposition in Drawn and Undrawn Poultry. U. S. Department of Agriculture, Bureau of Chemistry Circular 70, 1911.

(1226) Pennington, M. E., "Keeping Frozen Foods Hard Frozen in Shop of Retailer." Ice & Refrig. 81, No. 3, 169-72 (1931). - Period between removal of frozen foods from warehouse and consumption sets up serious problem; display case must make products visible to customer; temperature and requirements of display case; illustrations of typical display and storage cabinet; relation to household refrigerator temperatures.

E. I. 1931, 1205.

(1227) Pennington, M. E., A Review of the Accomplishments in the Field of Poultry Products Research. Proceedings of 7th World's Poultry Congress, pp. 32-8, 1938.

(1228) Pennington, M. E., "Quality Control in the Refrigeration Industries." Refrig. Eng. 38, 75-6, 99 (1939). - The importance of moving vegetables to refrigerated storage immediately after harvesting in order to prevent deterioration in Vitamin C content is emphasized. Freezing in such a manner that the ice will all be contained intracellularly is desirable from the standpoint of the quality of the product after thawing. Enzyme action must be studied in relation to the quality during frozen storage. Thus, in frozen beef, mutton and eggs, enzyme action is not a disturbing element. With peaches and certain other fruits, syrups of definite concentration are used to inhibit enzyme action. In the case of butter the storage temperature must be low enough to prevent enzyme action. Oxidation of fats must be prevented in cold-storage products. Storage in an atmosphere of carbon dioxide may be used for preventing deterioration. Desiccation of stored products can be prevented by proper relation between humidity, temperature and air movement.

C. A. 33, 9459 (1939).

(1229) Pennington, M. E., "Metal Containers for Freezer Storage." Refrig. Eng. 41, No. 3, 163-6 (1941); U. S. Egg & Poultry Mag. 47, 108-10 (1941). - Fruits, vegetables, poultry, meats, and fish are better preserved in freezer storage if contact with air is prevented or reduced to minimum; desiccation should be avoided for both appearance and eating quality; these ends can be accomplished by using metal containers of sizes and construction suited to commodities to be frozen. Before Am. Soc. Refrig. Engrs.

E. I. 1941, 472.

(1230) Pennington, M. E., "Conservation of Perishables by Refrigeration." Ind. Eng. Chem. 35, 62-5 (1943). - Cf. Refrig. Eng. 38, 75 (1939).

(1231) Pennington, M. E., "Refrigerated Warehouse of Tomorrow." Ice & Refrig. 106, No. 2, 97-8 (1944). - Trend of newer processed foods is illustrated; trend to lower temperatures; frozen cooked food. Before Am. Soc. Refrig. Engrs.

E. I. 1944, 890.

(1232) Pensinger, C. R., "Merchandising Frozen Food in the Department Store." Canner 101, No. 14, 20, 24 (1945). - Discussion of department store problems in having a frozen-foods section.

F. F.

(1233) Pentzer, W. T. and Asbury, C. E., "Observations on the Freezing Storage of Figs." Fruit Prod. J. 10, 218 (1931). - U. S. Department of Agriculture studied the freezing of figs at Fresno Laboratory. Can packaging better than paper-carton packaging for frozen figs because of less oxidation and thus greater preservation of color and flavor. Lots of figs packed in 30 to 50% syrup were best. Cutting figs in half prior to freezing found desirable. Storage at 10° to 12° F.

F. F.

(1234) Perlyweig, W. and Gies, W. J., "A Further Study of the Chemical Composition and Nutritive Value of Fish Subjected to Prolonged Periods of Cold Storage." Biochem. Bull. 3, 69-71 (1913). - Cf. Abstract No. 1410. Fresh fish may be preserved by the best cold storage processes for at least two years without undergoing important chemical changes or depreciating in nutritive value. The authors emphasize the fact that the results obtained by Smith and themselves apply only to fish sent to cold storage very soon after being caught and used within twenty-four hours after removal from cold storage.

C. A. 8, 1626 (1914).

(1235) Perry, R. L., "Air Velocity, Diameter of Product, and Freezing Rates." Refrig. Eng. 36, No. 1, 16-19 (1938). - It is shown that doubling air velocity can be expected to increase heat transmission coefficient about 60% and to reduce freezing time between 27 & 40%; however doubling air velocity produced four times velocity energy and friction loss and eight times fan power; air velocity should not be increased beyond point which will give reasonable rapid freezing.

E. I. 1938, 1022.

(1236) Perry, R. L., "Aim Toward Rapid Freezing Without Excessive Low Temperature." Ice & Refrig. 99, No. 1, 25-6 (1940). - Low temperature is undesirable because it tends toward over-freezing of outside layers of commodity, and toward increased loss by evaporation during freezing; it is also expensive method because it makes compressors operate at reduced capacity and with higher power and maintenance costs. Before Nat. Assn. Practical Refrig. Engrs.

E. I. 1940, 1022.

(1237) Perry, R. L., "Rapid Freezing Without Excessively Low Temperatures." Power Plant Eng. 45, No. 5, 70-2 (1941). - Before Nat'l Assn. Practical Refrig. Engrs. indexed in E. I. 1940, 1022 from Ice & Refrig. (July, 1940).

E. I. 1941, 1026.

(1238) Perry, R. L. Lindes Refrigerating Machine Company, A. G. F. I. A. T. Final Report No. 88, Office of Military Government for Germany (U. S.), Sept. 24, 1945. - Report of investigations into methods of Lindes Co., particularly the Krause-Linde procedure for quick freezing as a means of concentrating juices. Also investigations concerning blanching of potatoes by means of boiling water, steam, and a special apparatus from Firma Kuhne; and blanching of peas in boiling water and steam. Procedures given for dehydration of fruits and vegetables.

F. F.

(1238-A) Perry, R. L. Summary Report on Food and Agriculture Targets. F. I. A. T. Final Report No. 257, Office of the Publication Board (Washington) Report No. 1282, Oct. 2, 1945. 12 pages. - Among other topics, information is given on refrigerating equipment and storage, frozen foods, and dehydration. Eight frozen food plants were surveyed. Solo Feinfrost (Hamburg and Wunstorf) uses the Birdseye contact plate freezing process, under license, employing water or steam blanching but circulating brine instead of ammonia through the Birdseye freezer because of flexible hose trouble with ammonia. Andersen & Co. (Hamburg) uses air blast freezers of several designs; when freezing vegetables or fruits with sugar in the tray and tunnel type, these are left uncovered during freezing in two piece white waxboard cartons. Freezing times and conditions are given. Research indicated a preference for the Linde conveyor continuous air blast freezer; development had been carried out on a controlled humidity humid hot air blancher. The Krause fruit juice concentrating drum is described, also a Linde air blast contact-plate food freezer.

B. H. W.

(1239) Peters, F. N. and Musher, S., "Treating Packaging Materials." Food Ind. 10, 129, 175 (1938). - Treatment of packaging materials with an antioxidant is one way to cut down oxidation of packaged foods.

F. F.

(1240) Peterson, P. W., "Methods of Freezing Fish." Refrig. Eng. 9, 6-9 (1922). - The chronological development of methods of freezing fish is given. Several patented processes are discussed. Deduction that quick-frozen fish are superior in quality to sharp-frozen fish is made.

W. B. C.

(1241) Peterson, P. W., "The Bay City Freezer." Ice & Cold Storage 26, No. 299, 39-45 (1923). - Describes plant in Bay City, Mich., and methods employed; manufactures raw water ice and freezes fish for immediate shipment as well as for cold storage; ice system is Arctic-Pawnall stationary can raw water system; fish freezing system is known as Peterson Rapid Freezing System.

E. I. 1923, 565.

(1242) Peterson, P. W., "A Modern Fish Freezing Plant." Refrig. Eng. 10, No. 12, 425-31 (1924). - Describes Peterson methods using brine tanks, the brine not coming in contact with the fish, however; gives results obtained. Cf. Ice & Refrig. 67, No. 2, 103-8 (1924); Ice & Cold Storage 37, 317, 207-12 (1924); Refrig. W. 59, 13-18 (1924).

E. I. 1924, 574.

(1243) Peterson, P. W., "Quick Freezing Terminology." Food Ind. 2, 371 (1930).

(1244) Peterson, P. W., "Frozen Fish." Ice & Cold Storage 33, No. 388, 168-70 (1930). - Cf. Refrig. Eng. 20, No. 4, 217-18, 233 (1930). 2 figures. Various factors which affect future of frozen-fish fillet business in United States; question of economy; factors governing costs.

E. I. 1930, 1498.

(1245) Peterson, P. W., "Food Freezing Temperatures." Refrig. Eng. 24, 422-3 (1931). - A historical summary and a theory of quick freezing are given. The eutectic point of the fluids of the food is considered to be the optimum quick freezing temperature.

C. A. 25, 3737 (1931).

(1246) Phaff, H. J. and Joslyn, M. A., "Peroxidase Test for Blanching Requires Careful Application." Food Indust. 15, No. 3, 50-52 (1943). - Hay-like off-flavors and color changes in unscalded dehydrated vegetables are due to thermolabile enzyme systems. The peroxidase test for adequacy of scalding cannot be used indiscriminately for one can get false positive and false negative reactions. B. A. 17, 1510 (1943).

(1247) Phillips, M. G. and Fenton, F., "Effects of Home Freezing and Cooking on Snap Beans; Thiamine, Riboflavin and Ascorbic Acid." J. Home Econ. 37, 164-70 (1945). - In garden fresh Tendergreen beans the ascorbic acid was highest in immature beans; the thiamine was highest in overmature beans; the riboflavin did not change. Blanching and chilling caused a loss of 5-14% of the vitamins. During cooking about one-forth of the vitamins was lost. During freezing and defrosting there was little vitamin loss. Cooking solidly frozen beans in a minimum of water gave the best vitamin retention and most flavorful product.

C. A. 39, 2355 (1945).

(1248) Pickett, T. A. Chemical Studies of Frozen Fruits. Ga. Agr. Expt. Sta. Ann. Rept., 1931. 42 pages. - Cf. Woodroof. Ga. Agr. Expt. Sta. Bull. 168, 3 (1931). Peaches were frozen and stored in hypoisotonic and hyper-isotonic solutions of sucrose and NaCl. Those in isotonic solutions were better preserved than those in higher or lower concentrations. Peaches stored in buffer solutions at different H-ion concentrations showed no marked quality differences. When peaches were coated with shellac, collodion and paraffin and stored at 4.5° or at -15°, they were well preserved but had a disagreeable taste near the pit. The titratable acid had perceptibly increased during storage. Peaches frozen at -65° and stored at -15° had a lower respiration rate than those frozen and stored at -15°. The quick-frozen peaches had a lower percentage of soluble pectin and higher protopectin than those frozen at -15°.

C. A. 27, 1683 (1933).

(1249) Pickett, T. A., "Comparative Study of Juices from Frozen Fruits." Indust. and Engr. Chem. 24, No. 3, 353-4 (1932). - The juices expressed from eight frozen fruits had a greater freezing point depression and titratable acidity than juices of fresh fruits. Juices of fruits frozen at -73.3° C. were more like the juices of fresh fruits than those frozen at -12.2° C. Juices from frozen fruits increased in titratable acidity and freezing point depression on storage at -12.2° C. Dehydration accounted for only a small amount of these increases.

B. A. 7, 547 (1933).

(1250) Pickett, T. A. and Brown N. L., "Freezing Rates Under Varied Conditions." Fruit Prod. J. 12, 134 (1933). - Fruit frozen more quickly in a very cold alcohol bath than when packed in dry ice, although the dry ice was 10° less in temperature.

F. F.

(1251) Piettre, M., "Tests on Quick Freezing (Applied to Large Cuts of Meat.)" Food Ind. 9, 646 (1937). - A brief description of the quick freezing method for large cuts of meat and the advantages of this process.

E. M. F.

(1252) Piettre, M., "Crystallization and Desiccation of Certain Proteins by Cold." Food Research 3, 161-5 (1938). - The use of low temperatures for the purification, drying and crystallization of such pure proteins as serum albumin, myxoprotein, and oxyhemoglobin are discussed.

C. A. 32, 5859 (1938).

(1253) Pique, J., "Treatment of Rapid Frozen Produce." Brit. Assn. Refrig. 27, No. 2, 5-12, 13-25 (1930-31). - Cf. Cold Storage 34, No. 394, 4-7 (1931); Ice and Cold Storage 34, No. 395, 36-8 (1931). Practical problem survey; factors influencing reversibility; current methods; various brines; factors of success in food preservation. Before Brit. Assn. Refrig.

E. I. 1931, 1206.

(1254) Placanica, H. J., "Quick Freezing Seafoods." Ice & Refrig. 100, No. 5, 387-8 (1941). - Problems of autolysis, leakage, enzymic action and oxidation involved in the freezing of seafoods are discussed.

C. A. 35, 6342 (1941).

(1256) Plagge, H. H., "Fruits and Vegetables - Studies Relating to Their Freezing and Storage." Ice & Refrig. 94, 220-3 (1938). - Slow freezing temperature of 0° F. or approximately this temperature is satisfactory for the freezing and storage of fruits and vegetables prepared and packaged by the standard frozen pack methods. Refrigerated locker plants that maintain such temperature and provide for the quick removal of heat from packages are suitable for this type product. Fresh fruits and vegetables change rapidly in quality and nutritive values after harvesting and prompt handling is therefore necessary. Frozen preservation usually conserves vitamin C better than by other means of preservation. In order to reduce losses of vitamin C and sugar during scalding, the scalding time should be short. The effect of degree of maturity of the vegetables at the time of harvesting has a direct bearing on the quality and vitamin C content. Losses in vitamin C are rapid during defrosting, consequently fruits and vegetables should not be defrosted until they are ready to be cooked or used. Loss of green color in vegetables stored for some time is probably due to the transformation of chlorophyll into pheophytin by the actions of the acids of the cell sap. Within reasonable storage periods and with proper handling frozen vegetables should retain their color satisfactorily. As varieties of fruits and vegetables differ in their suitability for frozen pack storage, it is important to select the proper varieties. When frozen fruits and vegetables are properly prepared and handled there is no danger of botulism or food poisoning in the use of frozen-pack products. However, frozen fruits and vegetables always contain some microorganisms and should be handled as perishable foods.

C. A. 32, 4679 (1938).

(1257) Plagge, H. H., "Suggestions for Freezing and Storing Fruits and Vegetables in Refrigerated Locker Plants." Ice & Refrig. 95, No. 1, 31-6

(1938). - Summary of information obtained for investigations on freezing preservation as adapted for operators and patrons of cold storage locker plants; kinds of fruits and vegetables suitable for freezing preservation; scalding and cooling packing media; care in handling frozen fruits and vegetables. Bibliography.

E. I. 1938, 264.

(1258) Plagge, H. H. Refrigerated Locker Storage for Fruits and Vegetables. Iowa State Col. of Ag. and Mech. Arts Ext. Circ. 259, 1939. 16 pages.

(1259) Plagge, H. H., "Some Observations on Developments in Freezing Preservation of Fruits and Vegetables." Ice & Refrig. 97, No. 5, 361-2 (1939).- Notes on author's findings upon visits to various freezing plants and laboratories in Western states for purpose of observing something of frozen pack industry. Before Iowa Refrigerated Locker Assn.

E. I. 1939, 1005.

(1260) Plagge, H. H. and Lowe, B. Preservation of Fruits and Vegetables by Freezing in Refrigerated Locker Plants. Iowa State College Ag. Exp. Sta. and Ag. Ext. Service Bulletin No. P46 (new series), 1942. pp. 487-528. - Information on the selection, preparation, and utilization of fruits and vegetables. Equipment; kinds, varieties, and selection on basis of maturity, condition, and quality; preparation prior to packing (washing, sorting, trimming, cutting, scalding, cooling, and draining); packing (containers and brine vs. plain packing); similar data on fruits; labeling; freezing; storing; utilization; handling in the home; cooking.

B. H. W.

(1261) Plagge, H. H. and Lowe, B., "Frozen Fruit and Vegetable Research Indicates Desirable New Products for Lockers." Ice & Refrig. 102, No. 6, 357-61 (1942). - Among standard recommended varieties of vegetables, rapidly frozen and cooked after from five to ten and one-half months storage at 0° F., Swiss chard, beet leaves, New Zealand spinach, kale, spinach, beets, turnips, and kohlrabi yielded excellent products. Pineapples and plums were among the best of frozen fruits.

B. A. 17, 1398 (1943).

(1262) Plagge, H. H., "Four Lessons for Refrigerated Locker Patrons on Freezing Vegetables and Fruits." Ice & Refrig. 104, No. 5, 281-4 (1943). - Importance of being prompt about processing products for freezing; reasons why certain vegetables and fruits should be frozen same day as harvest; select kinds of fruits and vegetables that freeze easily and their correct varieties; directions for scalding vegetables; other necessary procedures of importance to locker patron.

E. I. 1943, 896.

(1263) Plagge, H. H., "Processing Equipment for Locker Plants." Quick Frozen Foods 5, No. 10, 58-9 (1943). - Information is given on simple equipment required, the steps in processing, and the method of scalding.

Where a locker plant is available, community freezing is more feasible than community canning or dehydration.

B. A. 18, 907 (1944).

(1264) Plank, R., Ehrenbaum, E. and Reuter, K. The Preservation of Fish by Freezing. Berlin, Germany: Zeutral Einkaufgesellschaft, 1916.

(1265) Plank, R., Ehrenbaum, E., and Reuter, K. "The Preservation of Fish by Freezing." Z.- K. I. 23, 37-41, 45-52 (1916); Avhandlungen den Volksernakrung. Berlin: Zentral - Einkaufsgesallschaft, 1916. pp. 242-4.

(1266) Plank, R., "On the Influence of Rate of Freezing upon the Histological Changes in Animal Tissues." Z. Allgem. Physiol. 17, 221-38 (1917).

(1267) Plank, R. and Kallert, E., "New Investigations on the Preservation of Meat and Fish by Freezing." Zeit fuer die Gesamte Kaelte Industrie 30, No. 1, 3-9; No. 2, 17-21 (1923). - Jan.: Describes Ottesen process of dipping fish into low temperature salt solution of given concentration (instead of exposing to cold air) and its application to freezing of meat. Feb.: Effect of velocity of freezing on changes in muscular tissues; results of tests showing superiority of Ottesen process.

E. I. 1923, 566.

(1268) Plank, R., "New Researches on the Preservation of Meat and Fish by the Freezing Process." Refrig. Eng. 13, 111-3 (1926); Z. Ges. Kaelte Ind. 32, 142-7 (1925). - Theories concerning the changes taking place in the cell membranes of animal flesh during the process of freezing: history, discussion of theories of dehydration and speed freezing. Cf. "Theories Concerning the Changes Taking Place in the Cell Membranes of Animal Flesh." Ice & Cold Storage 28, 234-5,261-3 (1925); "Refrigeration's Effect on Membranes." Refrig. World 61, 15

F. F.

(1269) Plank, R., Kuprianoff, J., and Peters, H., "The Quick Freezing of Food by Contact With Evaporating Refrigerants." UDI Zeit 76, No. 24, 583-7 (1932). - New method for rapid freezing of food products by contact with evaporating carbon dioxide; advantages over use of cold air or low temperature brine; measurements of freezing speed and discoloration of meat surface as function of storage time.

E. I. 1932, 1111.

(1270) Plank, R. and Heiss, R., "Annual Report of the Refrigeration Institute in Karlsrube Concerning the Activity for 1936-37." Landw. Jahrb. 85, 627-750 (1938). - A detailed report of refrigeration investigations including related physical chemical problems dealing with meats, eggs, fish, fruits, vegetables and other provisions is presented. Sublimation velocities of solid CO_2 were determined under varying conditions. A sixty day immersion of iron in pure glycol or in a mixture of glycol and ethyl alcohol showed no corrosion. A glycol-water mixture had a corroxion effect of about 20-30% of that of a 10% NaCl solution. The corrosion increased with addition of NaCl. Sodium silicate had a rust preventive

effect in the glycol-water solutions. No significant effects of metallic catalysts were noted on the absorption velocity of NH_3 by $CaCl_2$. Pressure of over six atmospheres of O_2 prevented growth of specific bacteria cultures of sea fish up to four days. A theory of cold injury to fruit is discussed and observations were made on the normal ripening course of pears and tomatoes. Experiments were conducted on storage in CO_2 and N gases.

C. A. 32, 5094 (1938).

(1271) Plank, R. Lectures Held for Future Planning on the Subject of Refrigeration and Food Preservation. Berlin: Verein Deutscher Ingenieure, Verlag, 1940. - Arranged by V. D. I. in N. S. B. D. T. in Jan. and Feb., 1940, under the scientific direction of Rudolph Plank.

C. A. 35, 2997 (1941).

(1272) Plank, R., "The Maintenance of the Freshness of Food by the Freezing Process." Schweiz Zeitschr. Obst. - U Weinbau 51, 443-50 (1942). - A lecture giving detailed description.

B. A. 18, 686 (1944).

(1273) Pleuthner, R. H., "Humidity Control Reduces Shrinkage in Cold Storage." Food Indust. 11, No. 8, 429-31 (1939). - In this article the author tells how to meet the responsibility of maintaining high humidity to prevent products from dehydrating and losing weight in cold storage.

E. M. F.

(1274) Polk, J. H., "Packing of Fresh Citrus Fruit and Pineapple Juice." Ice & Refrig. 90, No. 2, 143-4 (1936). - Illustrated description of patented vacuum cold-packing process used to preserve fresh citrus fruit and pineapple juice; specially designed juice extractor; tubular quick-freezing system used after juice has been placed in vacuum sealed containers.

E. I. 1936, 247.

(1275) Pollock, E. D., "Blast Freezing Plants." Refrig Eng. 48, No. 1, 16-9, 32, 56 (1944). - Cf. Ice & Refrig. 107, No. 2, 22-40 (1944); Modern Refrig. 47, No. 559, 251-2 (1944). Previous treatment of blast freezing of food products such as poultry, vegetables, fruit and meat, has for most part been primarily concerned with freezing at relatively low air velocities; velocities across surface of product in package of from 500 ft. to 3200 ft. per min. considered; comparative results of various air velocities; control of "freezer burn". Before Am. Soc. Refrig. Engrs.

E. I. 1944, 889.

(1276) Pollock, C. M., "Frozen Foods Will See the Light." Western Canner and Packer 37, No. 9, 52-3 (1945). - New freezer cases which display packages of frozen foods throw new emphasis on packaging. There will probably be emphasis on showing the contents and in view of this experimentation with cellophane is being conducted.

F. F.

(1277) Poulting, J. D., "Catechol Test Measures Activity of Enzymes That Cause Browning in Frozen Fruits." Quick Frozen Foods 7, Nos. 5, 31, 46 (1944). - Pretreatment to decrease the activity of oxidizing enzymes controls darkening of the fruit before freezing, during frozen storage and after defrosting. The extent of inactivation can be determined by spreading in approximately 1% aqueous solution of pyrocatechol on the cut surface of the fruit. After a few minutes the portion of the fruit still containing active enzymes will turn black. The test is negative if no color appears in twenty minutes. Various applications of the test are discussed.

C. A. 39, 2585 (1945).

(1278) Ponting, J. D. and Johnson, G., "Determination of Sulfur Dioxide in Fruits." Ind. & Eng. Chem. Anal. Ed. 17, No. 11, 682-6 (1945). - The sulfur dioxide content of frozen fruits and other types of fruits can be determined rapidly by extraction by blending in buffered sodium chloride solution, which stabilizes sulfur dioxide against enzymic and autoxidation; filtration; treatment with alkali to dissociate combined sulfur dioxide; and acidification and titration with iodine, with and without added formaldehyde, which binds sulfur dioxide.

F. F.

(1279) Poole, G., "Development of Rapid Freeze Processes Affecting Public Cold Storage Warehouses." Ice and Refrig. 79, No. 1, 45-50 (1930). - Discussion of business aspects of new process; effect upon fishing industry; opportunities for new cold-storage warehouse business methods of packing and shipping; tests made on frozen foods. Read before Am. Warehousemen's Assn.

E. I. 1930, 1499.

(1280) Poole, G., "Refrigeration as Factor in Eliminating Wastage in Food Production and Distribution." Ice & Refrig. 82, No. 2, 75-7 (1932). - Development of transportation and refrigerating facilities has made possible saving of millions of dollars worth of food products; development of quick freezing as means of preventing waste in perishable foods.

E. I. 1932, 1111.

(1281) Poole, G., "Report of Research Committee, Association of Refrigerated Warehouses." Ice & Refrig. 88, No. 5, 338-40 (1935). - Report of committee presented at 1935 annual meeting; handling fruits and vegetables; sterilization of grapes; experiments with fish; quick-freezing problems.

E. I. 1935, 240.

(1282) Poole, G., "Recent Progress in Quick Freezing." Refrig. Eng. 29, 69-73 (1935). - A review of common applications, new chemical findings and packaging and transportation problems.

C. A. 29, 5199 (1935).

(1283) Poole, G., "New Type of Low Temperature Cabinet." Ice & Refrig. 90, No. 2, 145-6 (1936). - Illustrated description of cabinet designed for dispensing of frozen food products; low temperature tests made to develop moisture proof construction; refrigerant controlled by thermostatic expansion valve.

E. I. 1936, 955.

(1284) Poole, G. and Zarotschenzeff, M. T., "Four Years Progress in Quick Freezing." Ice & Refrig. 91, 213-17, 300-3, 388-90 (1936). - This review includes a discussion of the scientific and technological developments of quick freezing, control of enzymes in the frozen product, bactericidal effects of freezing, preservative effects of freezing, effects of freezing on the tenderness of meats, effects of frozen storage on the vitamins, and modern methods of quick freezing and of storing and transporting the products.

C. A. 31, 168 (1937).

(1285) Poole, G., "Full Drawn Poultry and Quick Freezing." Ice & Refrig. 92, 205-6 (1937); U. S. Egg and Poultry Mag. 43, 156-8 (1937).

(1286) Poole, R., "Frozen Food Industry - Its Relation to Cold Storage Plant Operation." Ice & Refrig. 94, No. 1, 34 (1938). - Discussion of process of quick freezing, its effect on plant cells and tissues; storage in refrigerated warehouses. Before Nat. Assn. Practical Refrig. Engrs.

E. I. 1938, 1023.

(1287) Poore, H. D., "Passion Fruit Products." Fruit Prod. J. 14, No. 9, 264-8, 285 (1935). - Among other things the results of preserving the juice by freezing are mentioned.

B. A. 10, 962 (1936).

(1288) Postiglione, E., "Preservation of Meat for Feeding Troops. Meat Refrigerated and Frozen - Calories and Nutritive Value - Sanitary Inspection of Meat Preserved by Freezing." Ann. Igiene 45, No. 6, 405-25 (1935). - Frozen meat has been imported for Italian troops since 1909, and is considered unharmed in nutritive qualities. Refrigerating machines are better than ice as they permit constant temperature, humidity and pure air. Steer beef is used exclusively, requirements for the condition of animals before slaughter being rigid. Animals are exsanquinated and quartered. For "chilled beef" they are held 10-12 hours at 5-8° C., then stored at 0° C. Refrigeration is complete in 40 hours and meat may be kept about 40 days. Frozen meat is preferably frozen slowly, 8 to 10 days at -8 to -10° C. and transported in refrigerated ships at -10° C. It can be kept 8 to 10 months. Thawing should be done slowly under specified conditions and meat used within 24 hours. Rigid inspection is made at the destination as to quality, state of preservation, presence of parasites or bacterial infection, signs of mold or decomposition. Regulations are given in detail.

B. A. 11, 686 (1937).

(1289) Patter, M. T. and Dickson, M. A., "Vitamin A in Six Varieties of Frozen Cherries." J. Home Ec. 25, 47-51 (1933). - Frozen cherries of sour, sweet, and hybrid (Duke) types were studied: Montmorency, sour; Bing, Lambert, and Royal Ann, sweet; and Late Duke, hybrid. Montmorency ranked highest in vitamin A content, but all had high vitamin A contents and may be ranked among the fruits as a rich source of this dietary factor.

F. F.

(1290) Potts, R. C. The American Poultry Industry. Proceedings of 7th World's Poultry Congress, 1939. pp. 305-8.

(1291) Prescott, S. C., Bates, P. K. and Highlands, M. E., "Numbers of Bacteria in Frozen Food Stored at Several Temperatures." Am. J. Pub. Health 22, 257-62 (1932); Ice & Refrig. 92, No. 4, 311-13 (1932). - From the limited number of experiments it is difficult to formulate conclusions, but there is every indication that frozen food if carefully prepared and stored, can be merchandized with an adequately low microorganism content. Fluctuations were noted at all storage temperatures studied. The small numbers of bacteria present and the temporary slight increases noted do not seem sufficient to explain the chemical and physical changes (limited changes in pH, titrable acidity, weep, color, etc.) detected. The general decreases in numbers of bacteria noted make it seem still more unlikely that microorganisms are the sole or even the principal cause of these changes, which probably are enzymic. In certain foods the decreases in numbers of bacteria occur nore readily and to a greater degree at the higher storage temperatures, and this may be due to the lack of the protective action of extreme cold against the unfavorable environment provided the organisms by the foods.

C. A. 26, 2526 (1932).

(1292) Prescott, S. C., "Bacteria as Affected by Temperatures." Refrig. Eng. 23, No. 2, 91-6 (1932). - Historical review of work on bacteria; relation of bacteria to temperature, zone of inhibition, approximate thermal relations of bacteria; low temperatures inhibit.

E. I. 1932, 1110.

(1293) Prescott, S. C. and Greer, L. P., "Observations on Food Poisoning Organisms Under Refrigeration Conditions." Refrig. Eng. 32, No. 4, 211-2, 282-3 (1936). - Frozen foods exposed to various poison bacteria and stored at various temperatures to determine effect of low temperatures on number of surviving organisms, effect on diagnostic and cultural characteristics, and whether exposure to low temperature affects ability to produce illness and death when inocculated into susceptible animals. Before 7th Int. Congress Refrig., Hague, Holland.

E. I. 1936, 953-4.

(1294) Prescott, S. C. and Tanner, F. W., "Microbiology in Relation to Food Preservation." Food Res. 3, No. 1/2, 189-97 (1938). - A review of important recent publications on the effect of freezing on pathogenic bacteria, the effect of freezing on bacteria in foods, and the behavior of micro-organisms below freezing.

B. A. 12, 771, (1938).

(1295) Prescott, S. C., Pioneering in Food Technology: Appert and After Appert. Proc. Inst. Food. Tech. 1943, 1943. pp. 233-238.

(1296) Price, W. J., "Quick Freezing of Sea Foods." Refrig. 51, No. 6, 10-12 (1932). - Quick freezing of foodstuff considered under two headings: (1) preparation and retail marketing of packaged foodstuffs; (2) replacement of present freezing and sharp freezing methods; characteristics of

seasonal foodstuffs; charateristics of quick freezing of sea foods.
E. I. 1932, 1110.

(1297) Price, W. J., "Quick Freezing of Poultry." Ice & Refrig. 85, No. 5, 203-6 (1933). - Preservation of poultry by quick freezing interests perishable food industry; description of "Z" quick freezing plant used by Long Island Duck Growers' Marketing Cooperative Inc. at Center Moriches, L. Is., N. Y.; results obtained highly satisfactory from marketing standpoint.
E. I. 1933, 959.

(1298) Printz, M. V. H., "Heating Foods From Within." Food in Canada 5, No. 1, 14-16 (1945). - Heating foods by dielectric method gives an even temperature throughout each particle thereby developing flavor more uniformly. Dielectric heating is now used for roasting coffee and a wider application is expected. For liquids dielectric heating probably offers no advantage and such foods as bread and chicken do not develop a crust.
B. A. 19, 2318, (1945).

(1299) Proctor, B. E. and Greenlie, D. G., "Redox Potential Indicators in Quality Control of Foods. I Correlation of Resazurin Reduction Rates and Bacterial Plate Counts as Indices of the Bacterial Condition of Fresh and Frozen Foods." Food Res. 4, 441-6 (1939). - Studies concerned with proposal of other workers of use of resazurin as a chemical indicator for determination of sanitary quality. Author concludes that use of a modified resazurin technique has definite possibilities in providing a fairly rapid and reasonably accurate means of detecting certain foods containing extremely high bacterial populations; indicates tests now in progress which will utilize this method for check-ups during successive stages of food-packing processes.
F. F.

(1300) Proctor, B. E., "Advances in Refrigeration Biology." Refrig. Eng. 41, No. 4, 244-6 (1941). - Report on progress in refrigeration of foods during past year; refrigeration for army field kitchens; quick freezing of flower bulbs, nitrated ice for packing fish; freezing of ground peanuts; gas fumigation of grapes, etc. are cited.
E. I. 1941, 1024.

(1301) Proctor, B. E., "Simple Tests Reveal Improper Blanching." Food Indust. 14, No. 11, 51 (1942). - Blanching lengthens storage life, lessens color losses and discoloration, lessens development of off-flavors and reduces vitamin losses. Steam blanching is preferred in U. S., hot-water immersion in England. The effectiveness of blanching is measurable by catalase and peroxidase tests.
B. A. 17, 1846 (1943).

(1302) Pyke, W. E. and Brinkley, A. M. Freezing Fruits and Vegetables. Colorado Ag. Exp. Sta. Bulletin No. 478, 1943. - Varieties, quality-maturity selection, types of fruits and vegetables for freezing; prompt handling and cleanliness important; preparation and blanching procedures; sugar and

brine freezing; packaging and containers; storage; table of fruits and vegetables for freezing giving summarization of pertinent facts.

F. F.

(1303) Pyke, W. E., "No Tenderometer? Determine Quality From Pea Solid Readings." The Food Packer 26, No. 8, 44-6 (1945). - Discussion of "various laboratory analytical measurements" that reflected quality in peas compared with tenderometer measurements. Analyses were run for moisture, starch, sugars, and various vitamins. Close correlation was found between solids and starch and tenderometer readings, poor correlation was found between tenderometer readings and sugars.

F. F.

(1304) Rabak, W. "Freezing Preservation of Hot House or Forced Rhubarb." Western Canner and Packer 30, No. 3, 25-7, 29 (1938).

(1305) Rabak, W. "Some Observations on the Materials Used in Packaging Frozen Foods." Paper Trade J. 111, No. 9, 80-2 (1940). - Experimental data show that the amount of moisture lost from frozen foods depends upon the resistance to water vapor permeability of the wrapping or lining materials and on the efficiency of the sealing.

C.A. 34, 8072 (1940).

(1306) Rabak, W., "Some Effects of Storage Temperatures and Package Types on Weight Losses and Quality of Frozen Peas." Western Canner and Packer 33, No. 11, 52-5 (1941). - Cf. Abstract No. 1305. Package types have little effect on weight losses of frozen peas in storage when moisture losses are controlled with the use of moisture-proof lining or wrapping materials. Peas packed and sealed in paper-board packages and stored for 20 months at 15° F. lost approximately twice as much weight as those stored at 0° F. The extent of weight losses is governed by the relative moisture-vapor proofness of the lining or wrapping materials and the sealing thereof. Excessive weight losses (5% or more) of frozen peas in storage impair the flavor and color and other physical characteristics. A storage period of 20 months at 15° F. in any type of package results in considerable destruction of ascorbic acid. The ascorbic acid loss is not influenced appreciably by the degree of desiccation. Losses are much less at 0° F. than at 15° F. In peas which showed extensive dessication, there was a definite toughening of the skin with some flavor and color impairment.

C.A. 36, 3573 (1942).

(1307) Rabak, W. and Dehority. "Effects of Heat Sealing on Water-Vapor Permeabilities of Coated Cellophane." Mod. Pkging. 17, No. 7, 161-3, 220 (1944).

(1308) Rabak, W. "Protective Packaging of Frozen Foods." Refrig. Eng. 48, No. 5, 416-17 (1944); Good Packaging 6, No. 2, 21-23. - Factors influencing moisture permeability; packaging materials and package types; packaging affects quality retention; specialized packages are essential; new method of packaging frozen foods.

E.I. 1944, 754.

(1309) Rabak, W. and Stark. "Impact-Effect on Moisture Barriers at Low Temperatures." Mod. Pkging. 18, No. 8, 137-9, 166 (1945).

(1310) Radcliffe, L. "Recent Developments in Fish Distribution." Ice and Refrig. 76, No. 6, 501-2 (1929). - Notes on packaged fresh fish; rapid freezing of fish; use of trucks and airplanes; refrigeration on fishing vessels; increase in use of refrigeration. Paper presented at Am. Inst. Refrig.

E.I. 2, 1574 (1929).

(1311) Radcliffe, L. Freezing of Oysters. Oyster Inst. of Am. Buyers Bulletin No. 8, 1937. pp. 1-2.

(1312) Ramsbottom, J.M. and Koonz, C.H. "Freezing Temperature as Related to Drip of Frozen Defrosted Beef." Food Res. 4, No. 5, 425-31 (1939). - 20 beef rib cuts weighing over 23 pounds each and 54 rib steaks weighing ½ pound each were frozen at -50°, -30°, -10°, 0°, and 20° F., and thawed at 50° F. Irrespective of freezing temperature there was little drip in the large rib cuts wherein the area of cut surface was small in relation to the volume of the meat. The drip for the small steaks, where the area of cut surface was large in relation to volume of meat, was dependent on the freezing temperature of the steaks--the higher freezing temperatures contributing to more drip.

B.A. 14, 272 (1940).

(1313) Ramsbottom, J.M. and Koonz, C.H. "Relationship Between Time of Freezing Beef after Slaughter and Amount of Drip." Food Research 5, 423-9 (1940). - The amount of drip decreased in steaks as the time of storage between slaughter and freezing increased. The pH of the meat remained almost constant from the 1st day after slaughter to the 35th day. Alternate freezing and thawing had no effect on the pH value of the meat. When steaks were frozen at -17.8° and -34.4°, the ice crystals became progressively larger as the time between slaughter and freezing increased.

C.A. 34, 7464 (1940).

(1314) Ramsbottom, J.M. and Koonz, C.H. "Freezer Storage Temperature as Related to Drip and to Color in Frozen-Defrosted Beef." Food Res. 6, No. 6, 571-80 (1941). - 64 rib steaks and 24 primal ribs and rounds were selected for study. Cuts which were frozen at 10° F. were divided into two groups; one group was stored at 10° F. and the other group at -30°. Likewise, cuts frozen at -30° were divided into two groups; one group was stored at -30° and the other group at 10°. All cuts were thawed at 50°. Data were obtained on the drip from the defrosted beef, pH of the beef, ice crystal structure, surface color of lean tissue as indicated by color charts, and methemoglobin concentration in surface tissues. Beef held in freezer storage for 365 days had a much greater drip on thawing than did similarly treated companion cuts that had been stored in the freezer only 4 days. The amount of drip from beef cuts stored for 1 year at -30° was quite similar to the amount of drip from companion cuts stored for 1 year at 10°, providing that the cuts were frozen at the same temperature. During the course of one year, there appeared to be little change in the ice crystal structure of frozen beef stored at 10° or -30°. There was no significant change in the pH of beef stored for one year at 10° or -30°. The surface color of beef at the end of one year's storage was greatly influenced by the amount of methemoglobin present. A greater oxidation and consequently darker beef occurred in the superficial lean tissues at 10° than occurred at -30°.

B.A. 16, 1209 (1942).

(1316) Reay, G.A. Low Temperature Preservation of Haddock. Dept. of Sci. Ind. Rept. of Food Investigation Bd., 1930. pp. 128-35. - After storage at -2° C. or -23° C. and rethawing, the fish muscle was translucent and in good condition; storage at temperatures intermediate be-

tween these two, however, produced opacity and poor quality. The water content of the latter tissue was 2.8%, about half the normal, and some liquid was expressed. The coagulable nitrogen of the muscle was less soluble, and NaCl extracts of the tissue with from 2 to 30% NaCl solutions contain only about half the coagulable nitrogen. Immersion for 2 minutes in 20% NaCl before freezing greatly reduced the volume of liquid expressed from tissue frozen at intermediate temperatures. It is suggested that denaturation of the muscle protein is caused by concentrated salt solutions resulting from the withdrawal of water by freezing.

C.A. 21, 4944 (1931).

(1317) Reay, G.A. "The Preservation of Fresh and Thawed Fish in Ice." Soc.Chem. Ind. Jour. 54, 96T-8T (1935). - In this discussion, experiments are described in which fresh and thawed fish after storage in ice for various periods of time were compared. With cold-storage practice the general conclusions from these experiments are: (1) Storage at -21°, although it completely preserves freshness in the bacteriological sense, permits or induces changes--albeit slow--in quality. Cold storage therefore should never be employed with the idea of keeping fish for an unlimited time. (2) Ice preserves freshness in thawed fish (previously stored at -21°) to the same extent as in fresh fish, but permits rapid changes in quality. The consumer should therefore receive fish either in the frozen state or immediately after being thawed. Fish should be cured immediately after being thawed. (3) The standards of market judgment applied to fish which has not been frozen are not applicable to fish which has been frozen for which new and specific standards should be set up.

E.M.F.

(1318) Reay, G.A. "Some Observations on Methods of Estimating the Degree of Preservation of White Fish." Chem. and Indust. 54, No. 7, 145-8 (1935). - The methods discussed are organoleptic, bacteriological, and chemical. Distinction is drawn between preservation of freshness, that is, inhibition of autolytic and bacterial activity, and of quality, that is, inhibition of change in appearance, structure, and palatability due to the preserving process itself. Processes discussed are icing, freezing and cold storage and storage in atmospheres containing carbon dioxide. Since icing is most frequently employed, changes in quality are in this case regarded as normal, and are correlated with changes in freshness, which is maintained only for about a week. Gas storage and cold storage may preserve freshness for much longer periods, but only at the expense of some deterioration in quality. While this can be greatly minimized by suitable conditions of storage, the fish merchant should realize that his customary criteria—based on iced fish—are not applicable to gas stored or cold stored fish, the correlation between freshness and quality being completely altered. New and appropriate standards must be set up.

B.A. 9, 2114 (1935).

(1319) Reay, G.A. "Freezing and Cold Storage of Herrings." Ice and Refrig. 92, No. 2, 127-8 (1937). - Survey by Food Inves. Board of Gr. Brit. on cold storage of various types of herring; description of freezing and storage process; importance of temperature control.

E.I. 1937, 256.

(1320) Reay, G.A. "Freezing and Cold Storage of Fish." Mod. Refrig. 43, No. 508, 142-4 (1940). - Review of principles and their application in view of present exigencies; fish must be strictly fresh at time of freezing; importance of storage conditions; preventing loss of moisture; effect of freezing time; slow versus quick freezing.

B.I.1940, 1022.

(1321) Reay, G.A. "Scientific Research and the Fish Industry." Chem. and Ind. 61, 261-3 (1942). - This is a summary of the research by the Torry Research Station, Aberdeen, on the use of cold in the supply, storage, and distribution of fish. It discusses some of the problems involved, the biochemical studies of various aspects of freezing and storage and the palatability tests carried out. The result of these researches is the modern process of freezing fish which is briefly sketched in the work.

E.M.F.

(1322) Redeker, P.B. Refrigerated Locker Storage. Business News Publication Co., Detroit, Michigan, 1939. 112 pages.

(1323) Rederson, C.S. and Tressler, D.K. Improvements in Manufacture and Preservation of Grape Juice. New York State (Geneva) Agric. Exp. Station Bulletin No. 676, 1936. 29 pages. Preservation by several methods including freezing storage are discussed. Also much information concerning preparation of grape juice is given. The main causes of deterioration of grape juice are: the action of micro-organisms, the effect of enzymes, and the effect of air methods for removal of argols or crude tartrates are presented with particular reference to rapid methods including freezing and thawing procedures. Carbonation is also discussed.

F.F.

(1324) Redfield, G. Freezing Meats and Poultry. Purdue U. Agric. Exp. Station Miscellaneous Publication No. 22, 1943. 3 pages.

(1325) Reed, H.M. "The Freezing Storage of Figs." Ice and Refrig. 96, 425-6 (1939). - Loss of weight of Magnolia figs during freezing and thawing as well as the appearance and texture of the fruit were affected more by seasonal condition, the maturity and the method of preparation than by the concentration of syrup used to cover the fruit. Frozen fruit in which 25 to 35% syrup was used gave the best quality of packs, 30% syrup being preferred because of slightly better balance between flavor and sweetness. There was some deterioration of the figs during storage under the conditions of the experiments This was best retarded by the use of airtight containers. The addition of small amounts of citrus acid, or SO2 to the syrup in non airtight containers retarded the rates of deterioration without affecting flavor, but these additions in airtight containers altered the flavor. Figs of high quality must be used to maintain a good quality during storage.

C.A. 33, 6465 (1939).

(1326) Van Rensselaer. "Modern Quick Freezing Methods." Canner 91, No. 14, 15-16 (1940). - Plate and air blast systems of freezing are described. In spray freezing an invert sugar solution gives the most satisfactory performance. This method of freezing is said to prevent brown discolora-

tion and spotting in frozen apples and peaches. In commercial practice, best results have been obtained when the fruit has absorbed about 10% of its weight of the sugar syrup.

C.A. 34, 8072 (1940).

(1327) Retzer, J.I., Van Duyne, F.O., Chase, J.T. and Simpson, J.I. "Effect of Steam and Hot Water Blanching on Ascorbic Acid Content of Snap Beans and Cauliflower." Food Research 10, No. 6, 518-24 (1945). - Study which compares effect of hot water and steam blanching on ascorbic acid content of snap beans and cauliflower. Determinations made during preparations after quick freezing, and during freezing locker storage. No significant variations were noted in amounts present which could be due to method of blanching. 60-70% of the original total ascorbic acid was lost during processing and storage after nine months.

F.F.

(1328) Nuttall, G.H.F. and Gardner, J.S. work summarized by Reuter, K. "The Histological Changes in Frozen Fish and the Alterations in the Taste and Physiological Properties of their Flesh." J. Hyg. 17, 56-62 (1918). - The improvement of fish freezing by brine immersion (Ottesen process) is discussed with histological and physiological data given to show improvements. Water loss on thawing and flavor changes are noted.

F.F.

(1329) Reynolds, E.S. "Preserving and Marketing Frozen Foods in Hermetically Sealed Containers." Canner 72, No. 7, 17-20 (1931). - The advantages of the gas-proof tin can are retention of volatile flavoring compounds, prevention of oxidation and discoloration of the fruit, prevention of loss and of absorbtion of foreign flavors and finally, detection of spoilage of contents by distension of the ends of the can from gas pressure.

C.A. 25, 4067 (1931).

(1330) Reynolds, H.J. "Some Methods of Protecting Stored Frozen Poultry." Proc. 1st Food Conf. Inst. Food Tech. I, 189-92 (1940).

(1331) Richardson, J.E. and Mayfield, H.L. Vegetable Preservation Handbook for Wartime Use. Montana Agric. Exp. Station Circular No. 178, 1944. 23 pages. - Considers methods of preservation such as storage, canning, brining, pickling, dehydration and freezing.

B.A. 19, 2472 (1945).

(1332) Richardson, W.D. and Scherubel, E., "The Deterioration and Commercial Preservation of Flesh Foods I. General Introduction and Experiments on Frozen Beef." J. Am. Chem. Soc. 30, 1515-1564 (1908). - On the whole the results of the various lines of work reported in this paper, chemical, histological and bacteriological, indicate that cold storage at temperatures below -0.9° C. at least, is an adequate and satisfactory method for the preservation of beef for a period of 554 days and probably a much longer time.

E.M.F.

(1333) Richelet, J.E. "Changes in Cold Storage and Frozen Meat." Boll. Min. Agr. Buenos Aires 10, 282-9 (1909). - The character and prevention of slime, mold, and brown spot and similar conditions are discussed. Rev. Facult. Agrom. Vet. La Plata 2, No. 5, 226-36: an article with additions noted from another publication.

C.A. 3, 1895-6 (1909).

(1334) Richelet, J.E. "Changes in Frozen and Cold Storage Meat." Rev. Facult. Agrom. Vet. La Plata 8, No. 2, 71-88. - Parasites of frozen and cold storage meat, black and brown spot, and "bonestink" are discussed.

C.A. 6, 1473 (1912).

✓(1335) Riddell, W.A., Brocklesby, H.N. and Pugsley, L.I. "Frozen Fish Research: Chemical and Biochemical Studies of Halibut." Ice and Cold Storage 40, 189 (1937); 41, 14 (1938). - When halibut muscle juice became denatured during cold storage, a certain fraction of the globulin protein decreased in amount equal to the denaturization. During a 14 day icing period of the fish, the amount of the globulin fraction expressed from the muscle decreased. Denaturization increased during storage at 28° F. after freezing. This was more apparent when the muscle juice was stored at 35° F. for some time before freezing. If the juice is frozen while fresh and stored at -4° F. there was little increase in denaturization during storage for 24 days. However, if the juice is stored at 35° F. for various lengths of time, the effects of subsequently holding at lower temperatures increase until, e.g., holding at 35° F. for 14 days caused the denaturization occuring during storage, for 2 weeks at -4° to increase 50% over what it was for storage for 1 week at -4° F. As the storage period of the juice before freezing increased, the tendency was for denaturization to become greater. When the muscle juice was stored at 35° F., the pH remained constant until the 4th day, rising slightly on the 6th day, and markedly on the 8th day. The reduction-oxidation potential showed a fairly sharp change at about the 6th day. Portions of commercially iced fish were examined for trimethylamine during storage for 15 days. The increase in trimethylamine was slight until the 12th day from which time it increased rapidly. Trimethylamine content is taken as a measure of bacterial activity.

C.A. 32, 3500 (1938).

(1337) de Roberts, E. and Nowinski, W.W. "Effects of Freezing and Drying on Metabolism of Tissues. I. Respiration of Frozen and Dried Guinea-Pig Liver." Rev. Soc. Argentine Biol. 18, 333-45 (1942). - Based on the oxygen consumption of fresh liver slices as 100, the oxygen consumption of finely ground liver was 29.5, that of liver frozen in liquid air and then thawed was 18.5 and that of liver frozen and dried at -30° C. then placed in Krebs-Henseleit solution was 7.05, on an equal-dry-weight basis. The differences are attributed to destruction of cell structure and dilution of cytoplasmic components. Photomicrographs of the damaged tissues are shown.

C.A. 37, 2792 (1943).

(1338) Roberts, V. "A Study of the Effect of Different Methods of Cooking on the Vitamin C Content of Frosted Peas." J. Home Ec. 30, 582 (1938). - Summary of paper by author presented to research committee of the food and nutrition division of the 31st Annual Meeting of the American Home Economics Association. Losses of Vitamin C dependent upon the solubility

of the vitamin in cooking water, length of time vegetable is cooked, temperature of cooking, and length of time vegetable stands prior to cooking. Greatest losses due to solubility of vitamin C and to thawing at room temperature. Greatest retention was obtained when peas were cooked in top part of double boiler, where neither water nor steam came in contact with vegetables; this was true even though cooking time was longer.

F.F.

(1339) Robertson, W.F. "Why and How to Blanch." Quick Frozen Foods 7, No. 11, 90 (1945). - Blanching needs: time, type, temperature, subsequent cooling.

F.F.

(1340) Robinson, B. "A Frozen Fish Laboratory." Can. Chem. and Process. Indust. 23, 630 (1939). - Report of proceedings of second meeting of Canadian Chemical Association at which time a tour was made of plant of Canadian Fishing Co. Discussion of history and advancement of frozen fish industry presented by Mr. Carl Hedrien: freezing rates, glazing to prevent drying, factors in deterioration, and storage temperatures are included.

F.F.

(1341) Robinson, D. "Freezing Problems in the South." Quick Frozen Foods 7, No. 8, 85,96 (1945). - The South, with its climate and natural growing conditions is an abundant source of food for freezing. Some sections are ideal for cattle raising, and poultry is usually cheap. Fuel and power are inexpensive, because of natural resources. Insulation is a problem, however, because of the climate, and refrigeration is not easy because of high ambient temperatures, including those of rivers. Many commercial freezing plants are needed, however, to prevent waste in addition to providing market outlets. Locker plants also present excellent opportunities.

B.H.W.

(1342) Robinson, W.B. and Stotz, E. "The Indophenol-Xylene Extraction Method for Ascorbic Acid and Modifications for Interfering Substances." J. Biological Chem. 160, No. 1. 217-25 (1945). - "A rapid, accurate indophenol-xylene extraction method for the determination of ascorbic acid in common and highly colored food products" is described. Interference substances are eliminated, or their extent of interference discussed.

F.F.

(1343) Rogers, A.J. "Fruit Preservation." Ice and Refrig. 80, No. 1, 43-44 (1931). - Progress and development of preserving cherries by quick freezing process; co-operative growers' organization formed to stabilize product; opportunity for development of refrigerating machinery; Federal Farm Board loan enables organization to purchase entire crop of many growers in Northern Michigan.

E.I. 1931, 1206.

(1344) Rogers, A.J. "How to Quick Freeze Cherries Successfully." Refrig. Eng. 40, No. 4, 215-16 (1940). - Successfully frozen cherry pack must be free from oxidation and, when defrosted, must not have excessive amount of juice; how to accomplish this is described. Before Nat. Food

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E.I. 1940, 1023.

(1345) Rogers, M.T. "Latex Container and Its Application to Frozen Meats and Poultry." Quick Frozen Foods 2, No. 1, 17, 31 (1939).

(1346) Rorschach. "First Swiss Quick-Freezing Plant for Fruit and Vegetables, at Rorschach Canning Works." Sulzer Tech. Rev. 2, 20-5 (1942). - Arrangement and operating details of plant inaugurated after exhaustive study of similar plants and methods of operation in U.S.

E.I. 1943, 896.

(1347) Rosberg, N.H. "Quick Frozen Orange Juice--Its Processing and Handling." Ice and Refrig. 93, No. 3, 204-7 (1937). - Application of research work on oranges in California; description of vacuum cold packed quick freezing process used in plant of Calif. Consumers Corp., Los Angeles, Calif; preservation of flavor, aroma and freshness of ripe fruit.

E.I. 1937, 981.

(1348) Rosberg, N.H., "Processing and Handling of Quick Frozen Orange Juice." Refrig. Eng. 35, No. 1, 19-22, 51 (1938). - Work carried out in laboratory of California Consumers Corp., Los Angeles, California; difficulties in freezing process for orange juice; proceedure in vacuum cold pack quick freezing process; Indexed in E. I. 1937, 981. From Ice and Refrig., September, 1937.

E. I. 1938, 1023.

(1349) Rose, D.H. & Wright, R.C. Refrigerating Data Book. New York: American Society of Refrigerating Engineering, 1939. Fourth Edition.

(1350) Rose, M.S. & Phipard, E.H.F., "Vitamin B & G Values of Peas and Lima Beans Under Various Conditions." J. Nutrition 14, 55-67 (1937). - Fresh raw peas contained 3 Sherman-Chase units per gram. Freezing the peas after blanching had no effect on the vitamin B content, though cooking 15 minutes destroyed about 26%. Seasonal variations in vitamin B content were marked. Fresh Lima beans contained ½ as much B as fresh peas. Maturity in both vegetables resulted in a loss of ½ of their original vitamin B content. The growing seedling pea synthesized vitamin G but lost 50% of the vitamin B in fourteen days. Both geographic and seasonal differences in both B and G were found in both peas and Lima beans. The vitamin G content of Lima beans and fresh raw peas was the same, i.e., 1 Sherman-Bourquin unit per gram. No vitamin G was lost in cooking or freezing.

C. A. 31, 7480 (1937).

(1351) Rose, M.S., "The Effect of Quick Freezing on the Nutritive Values of Foods." J. Am. Med. Ass'n. 114, 1356-61 (1940); Quick Frozen Foods 2, No. 10, 10-17 (1940). - Prepared by Dr. Rose at the request of the Council of Foods, Am. Med. Ass'n. Quick freezing, when controlled as to quality of food to be frozen, freshness, sanitary care, subjection to low temperatures as speedily as possible, holding at -17.8°C. (0°F.) or lower while in storage, proper packaging, and maintenance of frozen state until use,

produces an excellent food. Refreezing of products once defrosted is not safe, but, used properly, there is little danger of bacterial poisonings or infections from frozen foods. The freezing process greatly reduces the number of micro-organisms. However, bacteria multiply rapidly upon thawing of food. Frozen foods show no loss in vitamin A or B content; little if any loss in riboflavin (vitamin G), the slight loss which may occur is due to blanching, not the freezing process; vitamin C values vary, little, if any, is actually lost in the freezing, but some loss occurs in storage before freezing, in blanching, and a slight loss may occur on thawing. This may be avoided by cooking without thawing. Loss of vitamin C in storage should not occur if the temperature does not rise above 0°F.

F.F.

(1352) Ross, H.C., "Meat Freezing Industries and Their Chemistry." Soc. Chem. Ind. Jour. (Chem. & Indust.) 45, 445-6 (1926). - This discussion is a description of the meat freezing industries. It describes the process from the actual slaughter, the period of 24 hours hanging of the meat with necessary examinations by a veterninary, the meat is next sent into the refrigeration chambers, where it is frozen at about 20° below freezing point, Fahrenheit. Here they remain for months or even years until the demand requires their shipment in refrigerator ships.

E. M. F.

(1353) Roush, J.M., "Quick Frozen Foods in Cans." Food Indust. 11, 10-11, 54 (1939). - New developments in assembly line production of frozen foods utilizing cannery procedures to facilitate handling and improve efficiency. Results of packing 59 frozen foods including vegetables, fruits, dairy products, seafood and fish in this test plant indicate it will mean reduced labor costs, greater sanitary control, and greater output.

F. F.

(1354) Rudolph, M., "Preservation of Fish by Refrigeration." Chemiker - Ztg. 63, No. 65, 555-6 (1939). - Preservation of fish by refrigeration; review of various processes, with special reference to Otteson rapid freezing process, Birdseye freezing process, and Zorotschenzeff or Z process. Food Ind. 11, 728 (1939).

E. I. 1939, 1004.

(1355) Ruhemann, M. & B., Low Temperature Physics. New York: MacMillan Co., 1937. - Principal problems that have occupied low temperature physicists since subject became separate brands of study proceeds from such large phenomena as condensation and fusion to processes intimately connected with elementary particles and fundamental structure of matter; principles of gas liquefaction and rectification. Bibliography Eng. Soc. Lib. N.Y.

E. I. 1938, 683.

(1356) Russell and Maddox. Preservation of Farm Products by Freezing. State College of Washington, Extension Bulletin 230 (revised), 1938.

(1357) Saburov, N. V. and Kaperina, L. V., "Testing the Color Fastness of Various Varieties of Peaches." Konsewnaya i Plodoovoshnaya Prom. 10, No. 3, 37-9 (1939). - Color changes in peaches are due to the oxidation of tannins. On the basis of tannin content, determined by $KMnO_4$ consumption, the known varieties of peaches are divided into 4 groups. The value of each group for making compote and freezing is given. Blanching of easily darkened varieties cannot be completed before the consistency of the flesh is injured. Blanching of non-darkening varieties serves to remove air and to pack the flesh.

C. A. 35, 6684 (1941);
C. Z. I, 1589 (1940).

(1358) Sair, L. and Cook, W. H., "Effect of Precooling and Rate of Freezing on the Quality of Dressed Poultry." Canadian Journal Research 16, Sec. D, 139-152 (1938). - The rate at which poultry is frozen has been shown to have no effect on the number of bacteria present, and little, if any, effect on the extent of surface desiccation or development of visceral taint. The development of taint appears to depend primarily on the period during which the product is held at temperatures above the freezing point, and little advantage is gained by freezing promptly after slaughter, since taint development occurs during thawing. A quantitative study of the amount of fluid exuded (drip) after freezing and thawing, whole birds show that, regardless of the rate of freezing, the whol bird does not drip. Freezing does change the condition of the water in the muscle, however, since drip can be obtained from minced meat after freezing. If minced meat is frozen within 3 hours of slaughter, the amount of drip is somewhat variable but apparently independent of the rate of freezing. If the birds are stored for 24 hours or more at 0° C., prior to freezing, the typical curved relation between the amount of drip and the freezing rate is obtained, the drip decreasing as the freezing rate increases. Using a constant rate of freezing (2.5 hours to pass from C° to -5° C.), the amount of drip decreases as the storage time prior to freezing is increased. During storage at 0° C., the greatest decrease occurs during the first day but continues for periods up to 2 weeks. At 10° C., little decrease occurs during the first five days, after which it decreases slowly until the product spoils. The amount of drip obtained at a given rate of freezing appears to be proportional to the amount of fluid obtained from the unfrozen material, showing that the drip is determined by the condition of the water in the original minced muscle. There were some indications that the state of the water in the tissue was partly determined by the pH, but the results were not conclusive.

E. M. F.

(1359) Sair, L. and Cook. W. H., "Relation of pH to Drip Formation in Meat." Can. J. Research 16D, 255-67 (1938). - The quantity of drip obtained from meat frozen at a constant rate is affected by the period between slaughter and freezing, and the pH of the tissue. These 2 factors appear to act independently, and only the latter was studied extensively. In precooled meats, the maximum amount of drip was obtained at about pH 5.2, and as the pH increased the net drip decreased to zero at about pH 6.4. Pork, beef and mutton behave similarly both with respect to the form of the drip-pH relation and the quantity of drip exuded at a given pH. Beef is normally more acid than the other meats tested, and this can ac-

count for its greater tendency to drip in commercial practice. Microscopic studies showed that large crystals were always produced by slow freezing, regardless of the pH of the material. The absence of drip from slowly frozen tissue at pH 6.4 is therefore not due to the crystal size, but must be attributed to the greater re-absorbing power of the proteins in this region. Protein denaturation does not affect the quantity of drip obtained when meat is slowly frozen or stored for periods up to 3 days in the freezing zone. The weak reabsorptive power of proteins at pH 5.2 must be attributed to their isoelectric condition in this region, rather than to their denaturation. It is only in this isoelectric region that the production of small crystals by quick freezing will reduce the quantity of drip.

C. A. 33, 251 (1939).

(1360) Samisch, R. and Cruess, W. V., "Enzymic Darkening in Apricots." Proc. Am. Soc. Hort. Sci. 31, Suppl. pp. 28-31 (1934); Exp. Sta. Record 73, 182. - The rapid darkening of apricots when dried without protective treatment is ascribed by the California Experiment Station to the existence of a complete enzyme-substrate system capable of producing a brown color. The steaming of apricots for 5 minutes did not decrease the rate of darkening. Only the anions of neutral salts were found to inhibit the oxidase of apricots. Ascorbic acid apparently played a part as a natural reducing agent in preventing the darkening of tissues.

F. F.

(1361) Sanderson, N. H., Jr. and Fitzgerald, G. A., "Bacteriological Flora during Spoilage of Frozen Vegetables." Rept. Proc. 3rd Intern. Congr. Microbiol., 710 (1939). - A streptococcus (probably S. fecalis) is most frequently associated with souring of quick-frozen vegetables. There is some evidence that it occurs in peas in the pod and on kernels of corn examined aseptically. The organism is a strong acid former. This may explain the fact that frozen vegetables always sour to the point of inedibility before other organisms can form toxic amounts of enterotoxic substances.

C. A. 35, 8126 (1941).

(1362) Sanderson, N. H., Jr., "Bacteriology and Sanitation of Quick Frozen Foods." Refrig. Eng. 42, No. 4, 228-32 (1941). - Sanitation in preparation of quick frozen foods should be made as nearly as possible automatic operation; methods of continuous self cleaning should be developed and utilized, since such means are far more effective and dependable than manual operations; all plant personnel should be trained and selected in relation to their habits of personal cleanliness. Bibliography.

E. I. 1941, 1025.

(1362A) Sandor, I., "Freezing Beef Stew Through Quality Control." Quick Frozen Foods 8, No. 2, 56 (1945). - Quality control of precooked frozen foods dependent upon actual cooking, therefore preparation should be in the hands of a competent chef. To make good beef stew: remove all gristle and inedible portions of meat and cut meat in one inch pieces and cook in flour at low heat without addition of liquid until enough meat juice is produced to nearly cover meat, then add liquids, etc., to make gravy; cook vegetables separately in gravy and add to meat and gravy. Then freeze.

F. F.

(1363) Savin, J. L., "Some Observations on the Freezing and Canning of Sweet Corn in the West and Northwest." Western Canner & Packer 32, No. 12, 13-15 (1940).

(1364) Sawyer, A. F., "Plate Type Evaporators as Used in Locker Plants." Refrig. Eng. 44, No. 1, 17-8 (1942). - As evaporating surface for room cooling, plates are arranged overhead in banks; for fast freezing, they are set up as shelves with products placed directly thereon; in author's opinion, in spite of rapid growth of locker plant industry, it marks only beginning of future possibilities.

E. I. 1942, 237.

(1365) Schaenzer, J. P., "Engineering Farm Refrigeration." Agricultural Engineering 26, No. 8, 317-20 (1945). - Discussion of farm freezers, with considerable details given. Zero temperatures or below are required. Sizes, quantity of food to be frozen at one time, etc., are discussed, with reference to other papers.

B. H. W.

(1366) Schede, A. L., "Electronic Heat Inactivates Enzymes in Potatoes." Food Indust. 17, No. 9, 1034-6, 1134 (1945). - Experiments concerning dielectric and electronic heating of foods are discussed. Experiments reported in article concerned with enzymic inacitivation by electronic heating. It is indicated that such blanching may be accomplished quite uniformly and rapidly. Diagrams and experimental details are given along with extimates of costs.

F. F.

(1367) Scheunert, A. and Reschke, J., "The Vitamin C Content of Some Frozen Fruits and Vegetables." Vorratspflege u. Lebensmittelforsch 2, 628-35 (1939). - The vitamin C content of raspberries and young peas is only slightly decreased by deep freezing. Storage for 1 year causes no essential loss. The loss of vitamin C content on household preparation of frozen peas is no greater than with fresh vegetables.

C. A. 35, 7052 (1941);
C. Z. I, 1118 (1940).

(1368) Scheunert, A. and Reschke, J., "Vitamin C Content of Potatoes. III. Effect on the Ascorbic Acid Content of Freezing and Thawing Potatoes." Biochem. Z. 304, 340-5 (1940). - Cf. C. A. 31, 5470. Freezing and storage in a cold place does not appreciably diminish the ascorbic acid content. Thawing causes a considerable fall in the content, with the formation of dehydroascorbic acid or of oxidation products which can no longer be reduced. This causes a total loss of 40-50%. Thawed potatoes are still satisfactory when steamed, but are no longer a good source of vitamin C when peeled and boiled. Thawing injures the cells and the resulting increase in oxidase activity is responsible for the sudden and extensive oxidation of the ascorbic acid.

C. A. 34, 8094 (1940).

(1369) Schlueter, H., "Automatic Operations in Cold Storage Plants." Refrig. Eng. 41, No. 4, 255-7 (1941). - Description of refrigerating equipment in cold storage plant; Hermitage Ice and Storage Corp., Richmond, Va.,

is a 5-story brick building consisting of 10 large cold storage rooms; changes made in installing automatic operation. Before Am. Soc. Refrig. Engrs.

E. I. 1941, 261.

(1370) Schmidt, T. E., "Electrical Engineering Applications in Cold Storage for Food Products." Electrotechnische Zeit 62, No. 2, 26-30 (1941). - Applications of electrical engineering in cold storage of food products; illustrated description of electric drive and of refrigerating machinery and apparatus and new refrigerating processes for food storage. Bibliography.

E. I. 1941, 260.

(1371) Schneckenberg, "Rapid Freezing of Meat in Brine Without Salt Penetration." Ice & Cold Storage 33, No. 378, 152 (1930). - Subject traced through early experimental stages to more recent researches; conclusions of research work.

E. I. 1930, 1501.

(1372) Schoppmeyer, W., "Development of Frozen-Food Packaging in Germany with Specific Consideration of the Plate-Freezing Process." Zeit fuer die Gesamte Kaelte-Industrie 47, No. 10, 156-8 (1940). - Development of frozen-food packaging in Germany; with special regard to plate-freezing process; description of system developed by Solo-Finnfrost Gmb H in 1939; with view to simplification and in order to conserve packaging material, new type of container was developed which is lined with genuine parchment paper and waxed on outside.

E. I. 1941, 866.

(1373) Schrader, A. L., "Cold Storage and Freezing Research." Refrig. Eng. 40, 163 (1940). - In an attempt to measure the quality of fresh, frozen and canned Lima beans it was found that ascorbic acid content was closely correlated with organoleptic tests under several variations experimentally produced.

C. A. 35, 5586 (1941).

(1374) Schwartze, C. D. and Diehl, H. C. Vegetable Variety Trials in Relation to Freezing Preservation. U. S. Department of Agriculture, Preliminary Report—Mimeographed Circular, 1936.

(1375) Schwartze, C. D., Boggs, M., Campbell, H., and Diehl, H. C. Vegetable Variety Studies in Relation to Freezing Preservation. U. S. Department of Agriculture, Progress Report 1937 (Mimeographed Circular 27), 1937

(1376) Schwartze, C. D., Rundle, C. H., Boggs, M., and Campbell, H. T. Relationship of Yield to Quality of Frozen Peas. Western Wash. Agr. Expt. Sta. Rept. for Year, March, 1940. pp. 34-5. - Present quality standards are based on the percentages of peas that will float or sink in a brine of specified density after the removal of the skins of thawed peas. The relationship of the tenderometer test to the brine test has not been closely checked. The tenderometer is well-adapted to measuring tenderness of fresh peas grown for freezing purposes. Laboratory experiments showed that

both tenderness and flavor are subject to rapid loss as a result of delay between vining and freezing. A judging panel found that approximately 100 pounds test on the tenderometer is the dividing line between highest quality and second grade peas.

C. A. 36, 5276 (1942).

(1377) Scott, W. J. and Vickery, J. R. Investigations on Chilled Beef. II. Cooling and Storage in the Meatworks. Australian Council of Scientific and Industrial Research, Bulletin No. 129, 1939.

(1378) Scupin, L., "Principles and Effects of Large Scale Cold Storage of Vegetables and Fruit." Zeit fuer die gesamte Kaelte Industrie 46, No. 8, 151-5 (1939). - Principles and effects of large scale vegetable and fruit cold storage; experiences with cold storage cabbage, onions, and apples described.

E. I. 1939, 259.

(1379) Sealey, J. Q., "Bacteria and Other Biological Factors in Relation to Frozen Foods." Refrig. Eng. 37, 310-12 (1939). - Spoilage changes occur in frozen foods similar to those in fresh foods only more slowly. Frozen foods are not sterile. Bacteria decrease in number but many survive. These are sufficient to cause spoilage in a few hours at room temperature. The autolytic enzymes of frozen foods are important in bringing about certain spoilage changes in such foods. Frozen foods may dry out during storage unless protected in some manner. Oxidation of fatty foods may occur during frozen storage. Quick freezing helps to conserve the vitamin content of foods, thus helping maintain their quality.

C. A. 33, 6455,(1939).

(1380) Seaton, H. L. and Griswold, R. M. Preservation of Fruits and Vegetables in Refrigerated Food Lockers. Ext. Bull. No. 208, 1940.

(1381) Seaton, H. L., "Locker Cold Storage Development." Proc. 30th Ann. Mtg. Am. Inst. Refrig., 1941.

(1382) Segal, S. C., "Refrigeration Load Calculations." Refrig. Eng. Appl. Data (Section 12), 1-4 (1940). - Elementary methods of calculating heat losses of refrigerating equipment and data pertaining thereto; actual data giving specific heats of some vegetables; tables; sample calculations.

F. F.

(1383) Self, V. F., "Air Motion in Refrigerated Spaces." Refrig. Eng. 42, No. 5, 291-5 (1941). - Discussion with specific reference to meat packing industry; distinction between air motion and air distribution; disadvantages of coil bank system and special advantages and disadvantages of unit coolers; expansion principle in air supply devices.

E. I. 1941, 261.

(1384) Senske, W. H., "The Heckermann Quick Freezing Process." Zeit fuer Eis - u Kaelte - Industrie 34, No. 5, 49-50 (1941). - Description of Heckermann low temperature refrigeration system; brief notes on principle of

ystem and its application; no technical data given.

E. I. 1941, 1027.

(1385) Shannon, R. T., "Cold-Packing Northwest Strawberries." Food Indust. 7, 64-5 (1935). - Berries packed 2 parts to 1 of sugar, rolled and rocked to insure mixing and form syrup by melting sugar, sharp frozen at -5 to 0° F. for 48 to 72 hours during which berries are rolled at intervals. Sliced berries treated in same way produce a product of higher quality flavor and color.

F. F.

(1386) Shepard, A., "The Quick-Freezing Process and the Distribution of Perishable Foods." Harvard Business Review 8, 339-345 (1930). - A review of the quick-freezing process and its prospects and influence on our food distributing system.

E. M. F.

(1387) Shepilevskaya, N. E., Efimova, M. Y., and Bogdanova, V. A., "C-Vitamin Activity of Canned Food." Voprosy Pitaniya 3-4, 34-43 (1941). - Cf. C. A. 34, 5949. Canned stuffed pepper, spinach puree, cauliflower, etc., showed in many cases a considerable content of vitamin C. Analysis of samples of dried vegetables showed the possibility of preservation of vitamin C. The investigation showed that frozen vegetables and berries contained vitamin C, while canned fruit had a slight C-vitamin activity. E. g., canned tangerine had little vitamin C, while the liquid in the can contained a large amount of vitamin C.

C. A. 37, 2479 (1943).

(1388) Sherman, H., "Precooling Methods Saving Fruit, Vegetables and Other Food Products Before Shipment." Ice & Refrig. 89, 289-90 (1935).

(1389) Sherman, H. C., Chemistry of Food and Nutrition. Fifth Edition. New York: Macmillian Co., 1937.

(1390) Sherman, V. W., "Electronic Dehydration of Foods." Electronics 17, No. 2, 94-7 (1944). - Experiments with electronic methods of dehydrating foods indicate that less than 100 Watts of energy per pound of compressed food is required for successful removal of practically all water; equipment operating at 29 Mc was used.

E. I. 1944, 414.

(1391) Short, B. E., Woolrich, W. R., and Bartlett, L. H., "Specific Heats of Foodstuffs." Refrig. Eng. 44, No. 6, 385-8 (1942). - Paper deals with variation of specific heat or heat capacity of different kinds of foodstuffs, such as fruits, meats, and vegetables, with temperature; results as presented are those determined by experimental means for 9 different fruits, meats and vegetables, and 6 different strengths of sugar solutions. Before Am. Soc. Refrig. Engrs.

E. I. 1942, 931.

(1392) Short. B. E. and Bartlett, L. H. The Specific Heat of Foodstuffs -

Parts I and II. U. of Texas, Eng. Research Series No. 40, Pub. No. 4432, 1944. 39 pages. - Part I. "An Experiment Determination of the Specific Heats of Foodstuffs" by Byron E. Short. Part II. "A Mathematical and Thermodynamic Determination" by Luis H. Bartlett.

F. F.

(1393) Shrader, J. H. and Johnson, A. H., "Freezing Orange Juice." Ind. Eng. Chem. 26, 869-74 (1934). - Survey of published works and commercial developments in freezing preservation of orange juice--difficulties cited. Variety of orange of great importance in quality of product--flavor maintained for over two years, vitamin C strength for at least a year during freezing storage. Discussion of chemical, physical and microbiological findings.

F. F.

(1394) Shrewsbury, C. L., Horne, L. W., Braun, W. Q., Jordan, R., Milligan, O., Vestal, C. M., and Weitkamp, N. E. Chemical Histological, and Palatability Changes in Pork During Freezing and Storage in the Frozen State. Purdue Agr. Expt. Sta. Bull. No. 472, 1942. 34 pages. - The products were frozen in Birdseye multiplate frosters at a temperature of -26° F. and stored at an average monthly temperature of -6.3° F., -8.4° F., and -8.2° F. Ammonia N of lean tissue increased to a maximum at 6 months' storage and then decreased but did not reach a value to indicate spoilage. There was no significant change in the pH value of lean tissue and little desiccation was noticed. Peroxides, free acidity development, N, I values, saponification numbers, and titer values of the fatty tissues showed no indication of rancidity or chemical decomposition of the fat during freezing or subsequent storage. Palatability was not affected after freezing for 12 or 16 weeks. There was a significant correlation between the palatability scores for tenderness and the tensile strength values of the roasts as determined by the shear machine. Antioxidants of the fat decreased. Freezing and storage had no effect on tenderness and cooking losses. There was intra- and extracellular freezing damage. The length of frozen storage had no effect on the amount of cellular damage. The chemical palatability and histological studies showed that pork from firm and soft carcasses had similar keeping qualities. Pork frozen and stored under these experimental conditions was in a very satisfactory condition at the end of 1 year and edible at the end of 16 months.

C. A. 37, 2833 (1943).

(1395) Shuttleworth, P. C., "Wrapping and Packaging Materials for Frozen Food Lockers." Refrig. Eng. 50, No. 4, 311-2 (1945). - Outlines the development of special grades of wrapping paper and containers suitable for use in locker plants--trend towards rectangular cartons which use minimum of space. Wrappings must give good protection at low cost--different grades of wrapping paper needed for different products. Recommends Dupont 300 MST or 450 MST type 53 for meats, butter, etc.; 300 or 450 MSAT-87 for fruits or berries in syrup. Cellophane seals with hot iron at 180-200° C.

F. F.

(1396) Sitsinskii, V. V., "Experimental Freezing of Strawberries, Raspberries and Plums." Konservnaya i Plodoovosh chnaya Prom. 10, No. 5, 19-21 (1939). - Data from experiments with frozen berries and plums are presented, especially for comparison of freezing in air, in 50% sugar syrup and in sugar. Vitamin C losses in the frozen products are attributed mainly

to atmospheric O present in the fruit tissues or at the surface, and to insufficient diffusion of syrup into the tissues.

C.A. 36, 5273 (1942).

(1397) Skinner, W.W. Report of the Chief of the Bureau of Agricultural and Industrial Chemistry 1943. U.S. Dept. Agric., Agric. Res. Admin. Report, 1943. pp. 11-50. - Research on industrial utilization of farm products is reported upon in considerable detail. Among the topics taken up are the solution of food dehydration problems and preservation of the quality of fresh foods by quick-freezing processes.

B.A. 18, 2382 (1944).

(1398) Sloan, H. "Low Temperatures and their Application." Ice and Refrig. 79, No. 4, 299-302 (1930). - No new principles involved in methods of obtaining low temperatures; perfection of quick-freeze process is more a problem of research work required than of engineering or merchandising; application at Cudahy plant; overnight freezing. Before joint meeting of Amer. Soc. Refrig. Engrs. and Nat. Assn. Practical Refrig. Engrs.

E.I. 1930, 1500.

(1399) Slocum, G.G. and Broyles, W.A. "Incidence of Coliform Bacteria on Fresh Vegetables and Efficiency of Lactose Broth, Brilliant Green Bile 2%; and Formate Ricinoleate Broth as Presumptive Media for the Coliform Group." Food Research 6, 377-85 (1941). - The results of this study suggest that there is an advantage in the use of a combination of 2% brilliant-green-bile and standard lactose broth for the detection of coliform organisms in food products.

F.F.

(1400) Smart, H.F. "Micro-organisms Surviving the Storage Period of Frozen-Pack Fruits and Vegetables." Phytopath 24, No. 12, 1319-1331 (1934). - Results of a five year study of approximately three thousand samples, including commercial and experimental packs from the principal production centers of the U.S.A., are reported. The data largely concern strawberries, to a less extent blackberries, cherries, figs, loganberries, raspberries, red currants, beans, beets, corn, Lima beans, mushrooms, peas, tomatoes and spinach. The numbers and identity of microorganisms on fresh strawberries prepared for frozen-pack, and on fruit held for one and three years at 15° F. are tabulated. Average reduction in number of microorganisms in strawberries during one year's storage at 15° was 99.3%; microorganisms surviving such storage included seven genera of fungi, a genus of yeast, and five genera of bacteria, the latter including about thirty species. Numerous species of bacteria and several species of molds and yeasts survived three years' storage at 15° in frozen strawberries. Microorganisms also survived storage at freezing temperature in other small fruits and in vegetables. The occurrence of undesirable organisms of human or animal origin, both in fresh material going into frozen packs and in some of the frozen pack products emphasizes the need for careful sanitary control.

B. A. 9, 1336 (1935).

(1401) Smart, H.F. "Growth and Survival of Micro-organisms at Sub-Freezing Temperatures." Science 82, 525 (1935). - 26 species of micro-organisms which had survived in frozen fruit stored at 15° F. for 3 years were studied in pure culture for growth and characteristics at sub-zero temper-

atures (16° F.). These studies were made on artificial media and only 5 failed to survive one year's "incubation" at 16° F. (-8.89° C.). 8 species produced visible growth during this period. Species identifications are given.

F.F.

(1402) Smart, H.F. and Brunstetter, B.C. "Lima Beans in Frozen Pack: I. Blanching Tests II. Microbiological Studies." Canner 83, No. 10, 14-16 (1936).

(1403) Smart, H.F. and Brunstetter, B.C. "Spinach and Kale in Frozen Pack. I. Scalding Tests. II. Microbiological Studies." Food Research 2, 151-63 (1937). - A 3 minute blanch (scald) in steam was best for high quality frozen-pack spinach. Experiments adding a 0.24% $CaCl_2$ brine to the blanched spinach were inconclusive. A 2% NaCl brine was not a satisfactory packing medium. A storage temperature of -9.4° C. was sufficient to protect the frozen spinach from loss of desirable color, flavor and texture. Wide variation in microbial content was noted in different lots of both fresh and frozen spinach and kale. The 3 minute blanch in steam reduced the bacterial content 99%. Very low counts were encountered in properly packed frozen spinach.

C.A. 31, 6755 (1937).

(1404) Smart, H.F. "Microbiological Studies on Cultivated Blueberries in Frozen Pack." Food Res. 2, No. 5, 429-34 (1937). - Experimental frozen packs of cultivated blueberries grown in New Jersey were prepared using Cabot, Pioneer, Concord, Rancocas, and Rubel varieties. The first three named were selected as having the best flavor and general dessert qualities after preservation by freezing using 50% sugar-syrup as a packing medium. Rubel and Rancocas varieties were considered inferior to the other three named. Numbers and types of micro-organisms found on fresh and frozen blueberries are listed. Less than 2% of the micro-organisms found on the fresh fruit survived the storage period of seven months at -9.4° C. The microbial types present in the frozen berries do not affect the healthfulness of the product but they are sufficient in numbers to cause spoilage in a few hours at room temperature. When cultivated blueberries of good quality are washed, packed and frozen, without undue delay, the microbial content of the frozen product should offer no problems to the packer or consumer.

B.A. 12, 956 (1938).

(1405) Smart, H.F. "Types of Survival of Some Micro-organisms in Frozen Pack Peas, Beans, and Sweet Corn Grown in the East." Food Research 2, 515-28 (1937). - Fresh vegetables contain large numbers of bacteria of the common soil types, as well as yeast and molds. Pre-treatment of scalding vegetables and the freezing and storage at -17.8° for from 5-7 months reduced the bacterial count in green beans, lima beans and sweet corn approximately 94.6-99.8%. Micro-organisms persist longest and in largest numbers on sweet corn. Frozen foods are essentially fresh foods and must be subjected to proper sanitary control during preparation and freezing. They must be cooked soon after thawing.

C.A. 32, 1349 (1938).

(1406) Smart, H.F. "Further Studies on Behavior of Micro-organisms in

Frozen Cultivated Blueberries." Food Res. 4, No. 3, 287-92 (1939). - The reduction in microbial content of cultivated blueberries during 9 months storage at 0° F. amounted to 99.7%; at 20° F. for the same period the content was reduced 99.9+%. The fruit held at 0° F. was of high quality; that held at 20° F. was not fit for food. A high microbial content of frozen blueberries may be an indication of inefficient methods of washing the raw fruit. Holding blueberries at 45° F. before freezing results in a high microbial content of the frozen berries. Bacteriological examination may be relied upon to give information as to the preparation and handling of fruit prior to storage, but it should not be the sole index in judging quality.

B.A. 13, 1367 (1939).

(1407) Smart, H.F. "Microbiological Studies on Commercial Packs of Frozen Fruits and Vegetables." Food Res. 4, No. 3, 293-8 (1939). - Data are given on the numbers and types of micro-organisms present in commercially frozen fruits and vegetables from 1929 to 1936. A comparison of the microbial content of these products shows that extremely high counts were less common in 1935 and in 1936 than they were prior to these years. The types of micro-organisms most frequently isolated were those considered to be without health significance, but which will cause spoilage promptly after defrosting. Defrosted vegetables were unfit for food in 24 hours at 30° C. while fruits were soft but edible.

B.A. 13, 1367 (1939).

(1408) Smith, A.J.M., Gane, R. and Dreosti, G.M. The Package in Relation to the Transfer of Heat. Dept. Sci. Ind. Research (Brit.) Rept. Food Invest. Board 1936, 1937. pp. 214-16. - In a series of experiments in which a cast iron bomb was packed with crabapples, wrapped and unwrapped, and with various materials between the fruit to prevent vertical convection currents, the time for half cooling from room temperature to 32° F. was determined by thermocouples inserted to a depth of 1.5 cm. into certain fruit. One paper wrap increased the time of half cooling from 5 to 7.7 hours, and packing with granulated cork produced about the same increase. Tin foil and paper increased the time but not to the same extent. When using packings, the highest temperature at half cooling was in the center apple, indicating that cooling was by conduction and that convection was almost absent. With the aid of the Gurney-Lurie (C.A. 17, 3899) charts, the apparent thermal conductivity in these packs of apples was calculated to be 0.00054 g. cal./sec./sq. cm./ degree/cm.

C.A. 32, 5949 (1938).

(1409) Smith, A.L. "Freezing and Melting Points of Fruits and Vegetables." Refrig. Eng. 21, 272-3 (1931). - Presents data and results of experiments performed by author at the University of Tennessee. Theory and methods used are given. Determinations of freezing and melting points were made using the juice of the fruit or vegetable.

W.B.C.

(1410) Smith, C.S. A Study of the Influence of Cold-Storage Temperatures Upon the Chemical Composition and Nutritive Value of Fish. Biochem. Bulletin No. 3, 1913. pp. 54-68. - The amounts of water; total solids; organic and inorganic matter; ammonium total; "soluble", "coagulable" and "non-coagulable" nitrogen; lipins (percent and acidity); and reducing substances and acidity of aqueous extracts, were determined in

samples of flesh from fresh flukes and winter flounders, and from similar fish of the same catch after remaining in cold storage for varying periods. From the results obtained there was no evidence whatever of any depreciation in nutritive value or change in the sanitary character of the fish at any time during nine months of cold storage.

C.A. 8, 1625 (1914).

(1411) Smith, E.V. and Weaver, L.E. Turkeys. Cornell Agriculture Experiment Station Extension Bulletin No. 359 (revised), 1939.

(1412) Smith, H.L. Jr. "Developments in Food Processing Methods." Jour. Amer. Diet. Assoc. 21, No. 5, 279-82 (1945). - Among other things the article mentions that "quick freezing and subsequent vacuum dehydration give products hardly distinguishable from the original in taste, appearance, or food value."

B.A. 20, 54 (1946).

(1413) Smorodintsev, I.A. and Bystrov, S.P. "Effect of Low Temperatures on the Physico Chemical Properties of Meat." Kholodil'naya Prom. 16, No. 3, 20-2 (1938). - The least swelling in water and salt solutions is obtained with meat that has been frozen at -25° C. Swelling is greater in NaCl solutions than in water, both for frozen and unfrozen meat; it increases as the salt content increases from 0.2 to 0.9%. The modifications in the properties of meat resulting from freezing (swelling, solubility of myasin and of oxygen) are at a minimum when freezing is carried out at -11° C.

C.A. 33, 3474 (1939).

(1414) Smorodintsev, I.A. and Bystrov, S.P. "Effect of the Rate of Freezing on the Physico Chemical Properties of Meat." Kholodil'naya Prom. 16, No. 4, 36-7 (1938). - Cf. Abstract No. 1413. The rate of freezing has a marked influence on the swelling of meat, but does not greatly affect the solubility of myogen and myosin. Meat frozen 12 hours at -11° C. shows minute swelling in water and in saline solutions. The solubilities of both myogen and myosin vary slightly with time of freezing, but follow different laws. Variations in the properties of meat, (swelling, distribution of protein nitrogen) are minute with very short (50 min.) or very long (24 hours) freezing; intermediate values are determined to meat quality.

C.A. 33, 8840 (1939).

(1415) Smorodintsev, I.A. "Chemical Changes in Frozen Meat." Khim. Referat. Prom. 5, 11-16 (1939); Khim. Referat. Zhur. 5, 134 (1940). - Cf. Abstracts Nos. 1413 and 1414. The effect of freezing on meat is due mainly to changes of the state of aggregation of water contained in the cell juice. Data are given on the effects of cryolysis and enzyme action, and of the pH on the swelling of meat. The changes in proteins, carbohydrates and fats of meat as a result of the action of enzymes is described.

C.A. 36, 3862 (1942).

(1416) Smorodintsev, I.A. "Theory of the Freezing Process of Meat." J. Applied Chem. (U.S.S.R.) 16, Nos. 11-12, 368-74 (1943). - The process of freezing of meat is accompanied by various chemical changes. Formation

f sugar and lactic acid in freezing of meat is due to the action of the nzymes which also account for changes in phosphorous containing subtances. Meat proteins are not cleaved or denatured by the process of 'reezing.

C.A. 38, 6410 (1944).

1417) Smorodintsev, I.A. "Chemical Changes in the Preservation and De-'rosting of Frozen Meat." J. Applied Chem. (U.S.S.R.) 16, Nos. 11, 12, '75-82 (1943). - Chemical changes occur in storage of frozen meat at temeratures of -8° C to -18° C. The changes are due to enzyme action. Gluose progressively decreases, while lactic acid accumulates. In stored uick frozen meat the changes occur more intensively than in slow frozen eat. Considerable enzymic cleavage of phosphatides occurs on storage; he cleavage does not reach the inorganic phosphate stage. Protein matter s unchanged over 2 month periods. The enzyme activity is more vigorous uring defrosting than during the freezing period, with slow defrosting iving more intensive reaction.

C. A. 38, 6410 (1944).

1418) Snell, E. E. and Strong, F. M., "A Microbiological Assay for Ribo-'lavin." Ind. Eng. Chem. Anal. Ed. 11, 346-50 (1939). - A biological asay for riboflavin, which is based on the essential nature of this subtance for the growth of Lacto-bacillus casei, is described. The reliaility of the method is supported by agreement of the assay results at lifferent levels, recovery of added riboflavin, successful determination f riboflavin in the presence of photolyzed extracts, and specificity of tructure required for activity. The results compare well with other bioissays for riboflavin on the same products. The method is rapid and reuires only very small amounts of sample.

E. M. F.

1419) Snow, J.C. Locker Refrigeration. U. of Tenn. Ag. Ext. Service 'ublication No. 215, 1941. 16 pages. - Plant facilities and methods of peration described.

E. B.

1420) Snyder, C.G. "Drawn or Undrawn Study of Flavor in Frozen Poulry." U. S. Egg and Poul. Mag. 38, No. 6, 18-23 (1932).

1421) Snyder, R. N. "Cutting Meats for Locker Plants." Refrig. Eng. 37, o. 6, 391-3 (1939). - A discussion of the best methods for cutting, reezing, and storage of different kinds of frozen meats in a modern lockr plant.

E.M.F.

1422) Sorber. "A New By-Product from Cull and Surplus Fresh Fruit." lue Anchor 12, No. 1, 4, 18 (1935).

1423) Sorber. "Frozen Sliced, Crushed and Pureed Fruits." Canner 94, o. 7, 16-17, 36 (1942); No. 8, 18, 20, 22, 32 (1942).

(1424) Sorber, D. G., "A New Quick Frozen Fruit Product." Fruit Prod. J. 11, 229-30, 249, 255 (1932). - Cf. Chace & Poore: Ind. and Eng. Chem. 23, No. 10, 1109-12 (1931). Fruit pulps frozen—method of pulping, pulp-sirup ratios, addition of fruit acids to some fruits low in acid content and color are discussed. Uses are for ice cream and sherbet, dressing for ice cream sundaes, also puddings, short cakes and the like. Thirteen kinds of fruits have been pulped and frozen.

F. F.

(1425) Sorber, D. G. and Chace, E. M. Preparation, Freezing and Use of Crushed and Pureed Fruits. U. S. Department of Agriculture Circular, 1942.

(1426) Sorber, D. G., "Freezing Storage Prolongs Peach Packing Season." Quick Frozen Foods 5, No. 9, 16, 28 (1943). - Work at Western Regional Research Laboratory has shown "feasibility of using freezing storage to hold, over extended periods, peaches intended for canning or other manufacturing purposes".

F. F.

(1427) Sorber, F. G., Ponting, J. D., Johnson, G., and Boggs, M., "Commercial Preparation and Freezing Preservation of Sliced Apples. I. and II." Quick Frozen Foods 7, No. 2, 38, 75 (1944); No. 3, 38, 42 (1944). - I. Nearly 34 million lbs. of sliced apples were preserved by freezing in U. S. in 1943. Three methods are available to prevent enzymic oxidation, viz., scalding in steam, immersion in sulfurous acid, and treatment with Na bisulfite. The last is considered best, and is used in concentrations giving from 0.2 to 0.3% SO_2. A one-minute dip is sufficient. Delay of 8 hours before freezing to ensure full penetration is recommended. A 1% solution of catechol will detect insufficiently sulfured material. Addition of sugar has not been found necessary for retention of quality during freezing storage. II. For treatment against darkening of apple slices to be preserved by freezing, Na bisulfite prepared by introducing 13½ ozs. liquid SO_2 and 8 ozs. NaOH per 100 gals. of water gives approximately 1,000 ppm. SO_2. Two or three times this concentration is recommended. Na bisulfite powder may be used at the rate of 4 lbs. 5 ozs. per 100 gals. of water. Solution is tested with methyl red. The concentration of SO_2 will diminish with use, as is checked by titration with 0-1 N iodine and 1% starch solution. When a 10 ml. sample is used, each ml. of the iodine solution required to impart a blue color to the starch indicator represents 320 ppm. SO_2.

B. A. 19, 774 (1945).

(1428) Southwick, C. A., Jr., "Requirements of Paper for Food Packages." Paper Trade J. 106, No. 9, 31-3 (1938). - Notes on purpose of package, function of food containers, requirements of food products, foods containing fats, moisture migration, organic vapor retention, frozen food requirements, procedure for testing, and detection of paper odors. Before Tech. Assn. Pulp and Paper Ind.

E. I. 1938, 859.

(1429) Southwick, C. A., "Current Trends in Food Packaging." Proc. 2nd Food Conf. Inst. Food Tech 1941, 57-60 (1941). - Chemical and physical data on the transmission of oxygen and other gases through thin films (such as are used in food packaging) are much needed. Vinylite, cellulose ace-

ate, cellulose aceto-butyrate and ethyl cellulose 0.002 inches thick show a transmission rate (in cc. of air per 100 hours per 100 sq. in. of surface) of over 250: regenerated cellulose, 600 gage, gave 61 cc., and rubber hydrochloride, 0.0017 in. thick, gave a value of 10 cc.

C. A. 36, 843 (1942).

(1430) Sparkes, B., Zero Storage in Your Own Home. Garden City, N. Y.: Doubleday Doran & Co., Inc., 1941. - Uses of a home unit; what it can mean to the user; operation and care; equipment for freezing; processing methods.

E. B.

(1431) Stahl, A. L. and Camp, A. F. Cold Storage of Citrus Fruits. Fla. Agri. Expt. Sta. Ann. Rept. 1935, 1936. 81 pages. - A large number of coatings and pretreatments for fruits were tried. On the basis of prevention of moisture loss, pitting, decay and retention of good appearance, the outstanding treatments were a commercial emulsion of carnauba wax, 80% with paraffin 20%, and borax with moisture proof wraps. Metal foils and moisture proof cellulose derivatives showed superiority as wrappers for oranges and grapefruit in cold storage. Large moisture proof bags or wraps for packing boxes were useful and much less expensive than individual wrappers. The combination tissue wrap and moisture proof liner proved most satisfactory. Gas storage studies showed that air and N were superior to H and O_2 in keeping citrus fruit in air tight containers. Citrus fruit held in ordinary cold storage at 37.5° F. in still air inside the tank kept fully 1 month longer than similar fruit held at the same temperature in a ventilated storage. When the CO_2 content was kept low and the humidity high within the air tight storage tank, the oranges and grapefruit kept 4 months in excellent condition. Frozen oranges when kept in cold storage at 37.5° F. while still in the frozen state and gradually thawed were eatable for 2 months. No detrimental effects were obtained from eating cold-stored oranges which had been frozen on the tree.

C. A. 31, 7135 (1937).

(1432) Stahl, A. L., "Concentration of Citrus Fruit Juices by Freezing." Quick Frozen Foods 6, No. 13, 32, 33, 36 (1944). - Reduction of the water content of citrus fruits by boiling, even when vacuum is used, results in loss of volatile substances responsible for flavor and bouquet. Concentration by freezing removes this objection. Juice of orange, tangerine, grapefruit, lime and lemon is partly frozen to form a slush, or frozen solidly and broken up before centrifugalization. The operation is repeated until the desired concentration is reached. Juice containing 10-12% soluble solids is concentrated by two operations to a soluble solids content of 48%. At a storage temperature of about 0° F. a Valencia orange concentration after 22 months was equal to the fresh product. The vitamin C content was 85% of the original. The acidity of lime and lemon concentration precludes microbial growth. Prompt deaerating of the fresh juice and tight packaging of the concentration are important. In use, water equivalent to that removed is added. Reconstitution is rapid.

B. A. 19, 156 (1945).

(1433) Stansby, M. E., "Methods of Preparing Sea Foods for Locker Plant Storage." Fishing Gazette 58, No. 1, 27 (1941).

(1434) Stansby, M. E. and Harrison, R. W. Preliminary Investigations of Methods for Freezing and Storing Fillets of Some Pacific Northwest Fish. U. S. Fish Wildlife Service, Scientific Report 15, 1942.

(1435) Stateler, E. S., "Where Carton Packaging of Foods Stands Today." Food Ind. 5, 94-9 (1933).

(1436) Stephenson, C.H. "Cooling 'Barreled Cherries'." Canning Age 7, 707-8 (1926).

(1437) Steudel, H. "Comparative Studies on the Digestibility of Canned, Dehydrated and Frozen Vegetables." Ernahrung 7, 1-6 (1942). - Studies in vitro showed that the method of preservation in itself exerts no influence on the digestibility of vegetables.

C.A. 37, 3194 (1943).

(1438) Stevens, A.E. "Optimum Conditions for Frozen Foods in Refrigerated Storage." Ice and Refrig. 101, No. 2, 207-11 (1941); Proc. 2nd Food Conf. Inst. of Food Tech. 1941, pp. 61-8 (1941). - Method of quick freezing is briefly described; storing regulations; mobile refrigeration problems; refrigerated trucks; ideal shipping containers discussed. Before Inst. Food Technologists.

E.I. 1941, 1026.

(1439) Stewart, G.F. "Poultry Becomes a Finished Product." Food Ind. 9, 384-5 (1937). - A description of the technique and steps involved in the process of preparing poultry full drawn as a frozen foods product.

E.M.F.

(1440) Stewart, G.F. and Drews, H.E. "Poultry Packers Put Quality Under Control." Food Ind. 10, 489-91, 559-61 (1938). - Mechanized handling, temperature regulation and other improvements preserve quality.

F.F.

(1441) Stewart, G.F. "Poultry Refrigeration." Section in Refrigerating Data Book. Fifth Edition. New York: Am. Soc. of Refrig. Engrs., 1943. Volume II, pp. 31-36. - Discussion of general aspects of poultry production and packing industry, one section devoted to freezing of poultry—quick freezing methods and advantages, microbial studies, another section on freezer storage. Bibliography. F.F.

(1442) Stewart, G.F., Hanson, H.L., Lowe, B. and Austin, J.J. "Effects of Aging, Freezing Rate, and Storage Period on Palatability of Broilers." Food Research 10, 16-27 (1945). - Broilers were frozen at -20.5°, -45.6°, and -67.8°, then stored at -23.3° for a total of 79 days in latex bags. The freezing time varied from 10 minutes at -67.5° to 5 hours at -20.5°. Fresh controls were consistently preferred to the frozen broilers. Neither aging before freezing or the freezing rate had any effect on the palatability scores. The differences in palatability scores between the fresh and frozen broilers were not highly significant until after 51 days of storage. Microscopic examination revealed vacuoles between the fibers of

breast and thigh muscles. These were considered indication of intrafibrillar freezing. The vacuoles were not present in birds held 18 hours before freezing. When frozen within 2 hours after slaughter no intrafibrillar freezing occurred at -20.5°. Vacuoles were found in the breast and thigh muscles of all birds frozen at -67.8° and in all breast muscles and half the thigh muscles of those frozen at -45.6°.

C.A. 39, 3085 (1945).

(1443) Stewart, J.J. Foods, Production, Marketing, Consumption. New York: Prentice Hall Inc., 1938. - Food problems, content of foods, fresh fruits and vegetables, preservation of foods, fats and oils, dairy products, meat and fish, poultry and eggs, beverages, food needs.

F.F.

(1444) Stewart, M.M. "Effect of Exposure to Low Temperatures on Numbers of Bacteria in Fish's Muscle." Soc. Chem. Industry J. (Trans. and Communication) 53, No. 54, 273T-8T (1934). - Results of investigation show that for long periods of storage, temperatures in region of -12° C. necessary to inhibit completely bacterial growth; temperatures above -6° C. are of no value for long periods of storage and are effective only for brief periods.

E.I. 1934, 240.

(1445) Stiles, W. "The Scientific Principles of Cold Storage." J. Soc. Chem. Ind. 40, 112-5T (1921). - A discussion of the preservation of food by cold storage above and below the freezing point and the problems involved in improving storage conditions. Fish and small pieces of beef were found to thaw without separation of liquid when frozen quickly to -21° C. suspended in brine.

C.A. 15, 3338 (1921).

(1446) Stiles, W. The Preservation of Food by Freezing With Special Reference to Fish and Meat. Dept. Sci. Ind. Research Food Investigation Board Sp. Rept. No. 7, 1922. 186 pages. - Cf. Abstract No. 1445. A presentation of the scientific principles involved in the preservation of food in the frozen states, the major topics of which are the physics and chemistry of the freezing process, the different freezing methods, the storage of food substances in the frozen condition, thawing and the preservation of fish and meat by freezing.

C.A. 17, 1515 (1923).

(1447) Stiles, W. "The Preservation of Fish by Freezing." Refrig. Eng. 9, 77-8 (1922). - Freezing of fish by freezing in cold air and freezing in a salt solution is considered. Comparatively long time is required to freeze fish in air; loss of water by evaporation, and the loss of surface mucilage with consequent deterioration in appearance and market value are given as the disadvantages of freezing in air with the simplicity of the method being its main advantage. The composition of solution, concentration of solution, temperature of solution, and gutting of fish before immersion in the cooling medium are factors considered in choice of conditions for freezing of fish in solutions. Reduction of freezing time is given as advantage of freezing fish in solution.

W.B.C.

(1448) Stimson, C.R., Tressler, D.K. and Maynard, L.A. "Carotene (Vitamin A) Content of Fresh and Frosted Peas." Food Research 4, 475-82 (1939). - Fresh frozen and fresh peas have approximately the same carotene content. About 25% of the carotene is lost during 11 months storage at -17.8°. Fresh peas contain approximately 6.1 I.U. per gram of vitamin A. A ratio of Vitamin A to carotene of 1.5 was obtained.

C.A. 34, 1764 (1940).

(1449) Stone, A.J. "The Jackstone Roto Froster." Quick Frozen Foods 2, No. 7, 16, 32 (1940).

(1450) Stone, A.J. "The Practical Side of Freezing." Refrig. Eng. 41, 252 (1941). - A description of the Stone Froster, consisting of 24 sets of freezing plates mounted parallel, radiating from and revolving around the drum axis, its method of operation and its advantage in freezing.

E.M.F.

(1451) Stone, J.F. "Cold Storage Insulation Design." Refrig. Eng. 37, No. 4, 229-31 (1939).

(1452) Stone, J.F. "Insulation for Low Temperatures." Refrig. Eng. 46, No. 1, 31-8 (1943).

(1453) Stone, J.W. "Measuring Moisture Protection." Refrig. Eng. 41, 326-27, 335 (1941). - Method for determining whether insulation specifications are adequate.

W.B.C.

(1454) Storp. "Frozen Meat." Apoth. Ztg. 28, 516. - Changes with respect to smell, taste, and color in the freezing room are negligible for the first few months. On thawing the meat assumes a doughy consistency, the weight being variable, depending as it does on a variety of factors as humidity, musculature, size, fatty covering, etc. Loss in weight is usually less when thawing takes place slowly. As the result of such loss, thawed meat is relatively richer in nutritive principles than the fresh product. The formation of protein decomposition products in the freezing room is minimal. Peptones could not be detected, nor any increase in NH_3 content. The quantity of albumoses in frozen meat, however, is higher than in the fresh product. Bacterial and fermentive changes in thawed meat were insufficient to spoil the product after a lapse of 48 hours. The fatty tissues of frozen meat suffered no appreciable change in the course of two months. Fat rendered from such material yielded normal constituents. The ratio of insoluble to soluble nitrogen on the one side, of soluble protein nitrogen to basic nitrogen on the other, are in the case of frozen meat different from those of fresh material.

C.A. 7, 3799 (1913).

(1455) Straka, R.R. and James, L.H. "A Health Aspect of Frozen Vegetables." Am. J. Publ. Health and Nation's Health 22, No. 2, 473-92 (1932). - A study was made of the possibility of botulinus poisoning from consumption of defrosted, improperly handled vegetables. 1200

ontainers of peas were prepared and frozen in Seattle, Wash., and shipped
o Washington, D.C. for study. The investigation included 4 types of containers, 3 methods of preparation, 3 degrees of inoculation, 2 methods of acking, and 4 methods of defrosting. Before freezing, the peas were inoculated with buffer suspensions of dried Cl., botulinum spores, a mixture f 4 strains (2 types A and 2 types B) being used. All peas were frozen n a cold storage room at 10° F. and the following determinations were ade on each container: total anaerobic count; total anaerobic bacterial pores; botulinus cultures isolated where possible from uninoculated peas; ydrogen ion concentration; toxicity—botulinus toxins, when present, dentified in guinea pigs. 120 containers were examined, 72 tin, and 48 ardboard. Of 72 tin containers, 24 uninoculated, 24 lightly inoculated nd 24 heavily inoculated, toxin was obtained in 2 uninoculated, in 4 ightly inoculated, and in 8 heavily inoculated. Of 48 Cardboard contain-rs (Peter's Type) 2 not inoculated, 2 lightly inoculated, and 5 heavily noculated, definitely showed toxin. The contents of all containers show-ng toxin had been stored at room temperature for 3-3½ days and were badly poiled. No toxin had developed in peas examined immediately after de-rosting or in those defrosted and held for 3 days in an ice refrigerator

B.A. 7, 407 (1933).

1456) Straka, R.P. and James, L.H. "Frozen Vegetables." Am. J. Publ. ealth and Nation's Health 23, No. 7, 700-3 (1933). - Glass container of rozen peas, 24 uninoculated, 24 lightly inoculated, and 24 heavily in-culated, were examined. No toxin developed in peas examined immediate-y after defrosting, and none developed in those defrosted and held for days in the icebox. Toxin was obtained from the spoiled peas in one of he 24 uninoculated containers, and Cl. botulinus cultures were obtained rom 8. The spoiled contents of 3 of the 24 lightly inoculated contain-rs were toxic, and cultures were obtained (presumptive identification) rom 11. The 24 heavily inoculated containers showed 5 to be toxic after poilage, and the organism was recovered (presumptive identification) rom every container. All the toxic containers showed type B toxin. Of he organisms recovered from uninoculated containers, 7 were type A and ne was type B.

B.A. 8, 1240 (1934).

1457) Straka, R.P. and James, L.H. "Further Studies on Frozen Vege-ables." Jour. Bact. 29, No. 3, 313-22 (1935). - Earlier experiments had hown that botulinus toxin may develop in defrosted peas within three and ne half days at room temperature. Further studies, including examination f 198 additional samples defrosted and held at 42, 50, 60 and 80° F. for -7 days, were made. Ten of these contained botulinus toxin one having een been held at 50° F. for seven days (uninoculated), six having been eld at 80° F. for two days (heavily inoculated), and three held at 50° or seven days (heavily inoculated). The remaining 188 contained no oxins, although some were badly fermented. It is concluded that when eas preserved by freezing are properly handled there is no danger of otulism. They should not be held at room temperature after defrosting d left-over portions should be well refrigerated and thoroughly cooked efore consumption.

B.A. 9, 2114 (1935).

458) Sugihara, J.S.T. and Cruess, W.V. "Effect of Blanching on Dehy-rated Vegetables." Fruit Prod. Jour. 21, No. 4, 104-6 (1941). - Vege-ables to be dehydrated should first be blanched preferably in live steam

for retention of flavor, odor, and cooking quality. Steam blanching also has the added desirable effect of precooking the product, which can then be refreshed easily and cooked quickly.

B.A. 16, 2325 (1942).

(1459) Sugihara, H. and Cruess, W.V. "Effect of Blanching on the Dehydration Rate of Vegetables." Fruit Producers Jour. 21, No. 5, 139-40 (1942). - Small lots (300-500 gm.) of spinach, cabbage, peas, string beans, sauerkraut, onions, carrots, potatoes, summer squash, Zuccini squash, cauliflower, corn and beets were dried to bone dryness in a small tunnel dehydrator at temperatures ranging from 140-150° F. One lot of each vegetable was blanched in steam and the other was not blanched. In most cases blanching caused an increase in the rate of drying. With cauliflower, peas and string beans the saving of drying time is very appreciable. The difference in yield was usually in favor of the unblanched because blanching dissolves some of the soluble matter from the vegetables.

B.A. 16, 2324 (1942).

(1460) Sweet, M.H. and Stewart, G.F. "Refrigerated Brine Sprays for Cooling Dressed Poultry." U.S. Egg and Poultry Mag. 48, 261-5, 308-13 (1942).

(1461) Swenson, T.L. and James, L.H. "Delayed Slow Freezing as Compared With Quick Freezing of Eggs." Ice and Refrig. 88, 405-6 (1935). - Cf. Abstract No. 1462. Quick freezing yielded a better egg product than did delayed slow freezing. Carbonation of the egg batter before freezing was suggested. The combined use of 1% salt and quick freezing was shown to be an effective mode of treatment.

C.A. 29, 5193 (1935).

(1462) Swenson, T.L. and James, J.H. "A Comparison Between Eggs Frozen at 0° and -109° F." U.S. Egg and Poultry Mag. 41, No. 3, 16-19 (1935). - Judged bacteriologically with experimental packs of egg batter the best results were obtained with a combination of quick freezing and treatment with CO_2. Salt 1% and quick freezing are also shown to be efficient.

C.A. 29, 3059 (1935).

(1463) Tadokoro, T. and Yoshimura, K., "Chemical Studies on the Denaturation of Proteins." J. Fac. Agri. Hokkaido Imp. Univ. Sapporo 25, No. 2, 118-32 (1928). - Salmon proteins were denatured by freezing, salting, and smoking. The following differences were noted between the denatured products and those obtained from fresh fish: (1) the body juices of the denatured fish contained more ash, fat, myosin, and myogen; (2) the denatured myosin and myogen had a greater specific rotatory power, mono-amino N, and free amino N content than the natural protein, but less diamino and histidine N; (3) the denatured muscle fiber had more mono-amino and free amino N, and less ammonia, diamino N, ash, and phosphorous.

B. A. 5, 1920 (1931).

(1464) Takahashi, M., "Sweet Corn Investigations." Hawaii Agri Expt. Sta Ann Rept. 1938, 54-5 (1939). - Analyses for total sugar content were made on sweet corn samples at intervals after picking up to 48 hours. The samples were stored at both room temperature (22 - 27° C.) and at refrigerator temperature of 10° C. The ears stored at room temperature lost 45% of the total sugar (wet basis) in the first 24 hours, but only about 4% during the next 24 hours. The ears under refrigeration lost only 9% of the total sugar during the first 24 hours and 12% during the second 24 hours. The importance of storing sweet corn ears under refrigeration to preserve quality is indicated by these data.

C. A. 36, 7168 (1942).

(1465) Tanner, F. W. and Williamson, B., "The Effect of Freezing on Yeasts." Proc. Soc. Exp. Biol. & Med. 25, 377-81 (1928). - Prolonged freezing temperatures (-13° to -15° C.) destroy cells of yeasts and bacteria; the rate of death is proportional to the number of living cells; there is a large initial reduction which grades off; there is great species variation in resistance to freezing with spore-formers generally being more resistant.

F. F.

(1466) Tanner, F. W., The Microbiology of Foods. Champaign, Illinois: The Twin City Printing Co., 1932. - Food preservation, food laws; bacteriology and microbiology of water, milk, milk products, fruits, vegetables, bread, sugar and sugar products, meat, eggs; canning and examination of canned foods; bacteria, yeasts, and molds.

F. F.

(1467) Tanner, F. W., "Microbiological Examination of Fresh and Frozen Fruits and Vegetables." Am. J. Public Health 24, 485-92 (1934). - Purposes and limitations of bacteriological control of foods in general. Specifically bacteria normally found on fresh fruits and vegetables, longevity of certain bacteria on surfaces of fruits - vegetables present greater problems in sanitary control because of their contact with soil - epidemics traceable to contaminated vegetables. Frozen foods present problems in bacteriological control for they contain many viable microorganisms - freezing does not destroy them, many are destroyed after a year's freezing storage, but the number of viable organisms reaches a basic minimum, from

which it decreases very slowly. Temperature of freezing has little or no effect upon number of viable forms. Since freezing does not necessarily destroy the bacteria, all materials, supplies, etc., which come into contact with the food should be properly controlled - proper handling is imperative. The development of the toxicogenic anaerobes as Cl. botulinum must be guarded against since such growth and resulting toxin formation is not out of the realm of possibility even in the face of low pH; fruits and vegetables have a high incidence of soil bacteria, and concomitant growth of Cl. botulinum and other bacteria may occur in pH ranges too low for Cl. botulinum to grow alone. The toxin of Cl. botulinum is not destroyed by freezing or freezing storage so that preformed toxin would be preserved in the foods. However it is impossible to control by bacteriological tests all foods prepared by frozen storage, so that standards of handling should be set up to effectively control freezing preparation of foods.

F. F.

(1468) Tanner, F. W., Beamer, P. R. and Rickler, C. J., "Further Studies on Development of Clostridium Botulinum in Refrigerated Foods." Food Research 5, 323-33 (1940). - Cf. C. A. 31, 2628. In general, detoxified spores of Cl. botulinum may germinate and produce toxin in foods more alkaline than pH 4.5 and stored at 15° to 20°. Occasionally toxin formation occurred in nonacid foods at 10°. If properly frozen and kept frozen until shortly before use, frozen foods are probably as safe and satisfactory as fresh foods. However, frozen foods should not be allowed to thaw and remain at 10° for long periods of time.

C. A. 34, 7458 (1940).

(1469) Tapley, W. T., "Varieties of Vegetables Suitable for Freezing." Ice & Refrig. 94, No. 2, 125-7 (1938). - Importance of selecting proper variety of vegetables to obtain best quality and appearance; list of varieties that proved especially suitable for freezing.

E. I. 1938, 1024

(1470) Tarr, H. L. A, and Sunderland, P. A., "Quick Frozen Fish Fillets. The Role of Preservatives in Enhancing Keeping Quality." Ice & Cold Storage 42, No. 496, 91-2 (1939). - The comparative preservative actions of sodium benzoate, benzoic acid, potassium nitrite, hydrogen peroxide, chloroform, boric acid, hydrochloric acid, sulphur dioxide and para-hydroxybenzoic acid ethyl ester for fresh flounder and frozen halibut are given.

C. A. 34, 184 (1940).

(1471) Tarr, H. L. A. Loss of Free Liquid on Heating Brined, Unbrined, Unfrozen, and Defrosted Fillets. Pacific Biology Station and Pacific Fisheries Experimental Station, Biology Board of Canada Progress Reports 45, pp 19-20, 1941.

(1472) Tarr, H. L. A. Formation of Drip in Fish Muscle and Its Control in Defrosted Fish. Pacific Biology Station and Pacific Fisheries Experimental Station, Biology Board of Canada Progress Reports 47, pp 5-9, 1941.

(1473) Tarrant and Winters. Freezing Vegetables and Fruit for Home Use. Pennsylvania State College Agriculture Extension Service, Circular No. 252, 1944. - Successful frozen foods; economy of freezer-locker; planned food supply; types of freezers, care of home freezing unit, records, organized system of storing, equipment, and containers, freezing vegetables, freezing fruits, storage of foods, preparing frozen foods for table use, precautions. Two charts: Directions for freezing vegetables and directions for freezing fruits.

F. F

(1474) Taylor, "Correct Papers and Packages for Locker Storage." Western Frozen Foods 3, No. 2, 10, 12 (1941).

(1475) Taylor, D. M., "Frozen Fruits and Vegetables in Pacific Northwest." Ice & Refrig. 81, No. 3, 173-6 (1931). - Production of fruits and berries in Oregon and Washington; Ray-Maling quick freeze plants at Hillsboro, Ore.; progress of crate of strawberries through plant; handling of vegetables for quick freezing; special machinery; standard carton adopted; refrigeration machinery.

E. I. 1931, 1206.

(1476) Taylor, D. M., "Quick-Freezing on Commercial Basis." Refrig. 50, No. 1, 20-21 (1931). - Birdseye Packing Co.'s experimental pack on 1500 tons of fruits and vegetables; quick-freezing spinach; features of belt-type refrigerating machine.

E. I. 1931, 1206.

(1477) Taylor, H. F. Brine Freezing of Fish. Economic Circular 53, U. S. Bureau of Fisheries, 1921. - Cf. Refrig. W. 57, No. 1, 21-4 (1922).

(1478) Taylor, H. F., "Brine Freezing of Fish." Refrig. World 57, No. 1, 21-4 (1922). - Refrigeration promises only solution of problem of distributing fish from sea to distant consumers in first class condition; Describes brine freezing process; brine frozen versus air frozen fish.

E. I. 1922, 537.

(1479) Taylor, H. F. Refrigeration of Fish. Doc. 1016, U. S. Bur. Fisheries, 1927. - A comprehensive book presenting all phases of fish refrigeration: effect of refrigeration on cost; scientific principles involved in refrigeration of fish; changes during freezing; changes during storage; design and construction of freezers; practical freezing methods; transport of frozen fish; other methods of freezing, defrosting and cooking are some of the topics discussed.

F. F.

(1480) Taylor, H. F., "The New Fisheries." Power 68, No. 2, 64-6 (1928). - Cf. Ice & Cold Storage 31, No. 366, 229-30 (1928); Refrig. Eng. 15, No. 6, 147-50 (1928); Refrig. Eng. 16, No. 3, 86-7 (1928). - Scientific discoveries have provided vastly improved techniques of applying refrigeration to fish; if freezing is sufficiently rapid crystals either do not form, or if they form, they are for practical purposes without effect; fillets at 32° are conveyed to automatic freezer, which is continuous in operation;

dip into calcium chloride brine at from 15 to 20° F. and are frozen in forty minutes. Abstract of paper presented before Am Soc. Refrig. Engrs.

E. I. 1928, 1580.

(1481) Taylor, H. F., "Solving the Problems of Rapid Freezing." Food Ind. 2, No. 4, 146-151 (1930). - Cf. Ice & Refrig. 79, No. 2, 111-21 (1930). Review of application of refrigeration to preservation of perishable foods; part played by rapid freezers in fish industries; research work along rapid-freezing line; tables illustrating results; importance of packaging and storing stressed; carload shipments most economical.

E. I. 1930, 410.

(1482) Taylor, H. F., "Fish Steaks." Food Industries 2, 545-7 (1930). - A standardized product in a standardized package.

F. F.

(1483) Taylor, H. F., "Refrigeration in the Preservation of Foods." Refr. Eng. 19, 134-7 (1930). - General considerations, preservatives - how refrigeration preserves, effects of refrigeration on foods, refrigeration and the preservation of fish, problems presented by refrigeration of foods and future of frozen foods are discussed. Complete paper as presented at the World Engineering Conference, Tokyo.

F. F.

(1484) Taylor, H. F., "What Happens During Quick Freezing." Food Ind. 3, 205-6 (1931). - T. deprecates the errors and half-truths circulated about quick-frozen foods and explains the changes occurring in freezing on a colloidal chemistry basis rather than a mechanical one.

C. A. 26, 5668 (1932).

(1485) Taylor, H. F., "Advances in the Preservation of Fish by Freezing." Ind. Eng. Chem. 24, 679-82 (1932). - Common methods of handling fish for freezing are described in detail. The juice or drip from frozen meat or fish is not due to laceration of cell membranes by ice crystals but rather to a colloidal phenomenon as follows: during freezing storage, the highly hydrated protein colloids gradually become coagulated and separate into two phases, one of which is a more concentrated gel, and the other a free-flowing liquid phase containing a lesser amount of heat-coagulable albumins and globulins. Apparently the cause of this separation is a decreased pH, probably approaching the isoelectric point of some of the proteins, at which point proteins have their minimum capacity for hydration, solubility, and other colligative properties. These proteins may be so adjusted by means of electrolytes and buffers that few changes occur during freezing and storage; hence, on defrosting, the drip of juice is greatly reduced.

C. A. 26, 4108 (1932).

(1486) Taylor, R. B., "New Method of Quick Freezing." Food Industries 9, No. 6, 457-8 (1936). - Two principles accepted are (1) the quicker the product is frozen the better the quality, (2) extremely low temperatures affect quality of product adversely; what happens to fruits and vegetables when they freeze; discussion of theory of freezing.

E. I. 1937, 980.

1487) Taylor, R. B., "New Method of Quick Freezing." Food Ind. 9, 701-4 1937). - A discussion of the theory of freezing, with regard to fruits nd vegetables, brings out further points which explain the manner in which the new process of quick freezing is considered an improvement over slow freezing processes.

E. M. F.

(1488) Taylor, R. B., "Quick Freezing Fruits and Berries." Refrig. Eng. 36, No. 5, 303-6 (1938). - Review of research on quick freezing carried out at Univ. of Tenn. since 1934; equipment developed; results of experiments. Before Food Preservation Conference, Univ. Tenn.

E. I. 1938, 1023.

(1489) Terrel, "Locker Industry Meets New Conditions - Home Units to Foster Sales of Frozen Foods." Ice & Refrig. 109, No. 4, 55-6 (1945).

(1490) Theones, F., "The Bound Water in Colloids and Animal Tissues." Biochem. Zietschrift 157, 174-86 (1925).

(1491) Theriault, F. R. and Fellers, C. R., "Effect of Freezing and of Canning in Glass and in Tin on Available Iron Content of Foods." Food Research 7, 503-8 (1942). - Commercial quick-freezing of foods was found slightly to increase the availability of Fe. Canning in glass had little effect or no effect on total and available Fe in foods. Foods canned in tin showed correlation between changes in Fe content and pH. No changes or slight gains in Fe were observed in vegetables but considerable gains were observed with the more acid product, peaches.

C. A. 37, 1517 (1943).

(1492) Todhunter, E. N. and Sparling, B. L., "Vitamin Values of Garden Type Peas Preserved by Frozen Pack Method. I. Vitamin C (Ascorbic Acid)." Food Research 3, 489-98 (1938). - Measurement of the ascorbic acid content of garden peas frozen by the frozen pack method in hermetically sealed containers showed comparable values by animal assay and by titration with 2,6 dichlorophenolindophenol. There was no difference in ascorbic acid content of Telephone peas scalded for one minute in steam or in water at 99° C. Scalding in water for three minutes at 99° C. and for two, four, and six minutes at 71° C. resulted in a lower content of ascorbic acid. Smaller peas were higher in ascorbic acid per unit of weight than larger peas of the same variety; the seed coat,contained more ascorbic acid per gram than the cotyledon. Thawed peas removed from the original hermetically sealed containers and allowed to stand at room temperature lost 16% of their ascorbic acid in thirty minutes, and 27% in one hour; 5% was lost on standing 24 hours in a refrigerator at 4.5° C. Variental differences influenced the ascorbic acid content of peas.

C. A. 33, 7915 (1939).

1493) Todhunter, E. N., "Vitamin Values of Garden-Type Peas Preserved by Frozen-Pack Method. II Vitamin A." Food Research 4, 587-92 (1939). - Cf. Abstract No. 1492. Quick-frozen peas contained ten intern. units of vitamin A per gram. Controls on fresh peas were not made. The blanching (scalding) period did not affect the vitamin A content. Varietal differ-

ences were slight. Cooking by boiling had no effect on the vitamin A content of the frozen peas.

C. A. 34, 1410 (1940).

(1494) Todhunter, E. N. and Robbins, R. C. Ascorbic Acid (Vitamin C) Content of Garden-Type Peas Preserved by the Frozen Pack Method. Wash. Agri. Expt. Sta. Bulletin No. 408, 1941. 28 pages. - Cf. Abstract No. 1492. Marked losses in ascorbic acid took place when the peas were shelled and allowed to stand at room temperature for eight hours or more before freezing. Peas that had been blanched (scalded) showed rapid loss in ascorbic acid by solution. Steam blanching is preferable to hot water. Cooling by means of a cold air blast conserves vitamin C to a greater extent than cooling by immersion in cold water. Blanching in hot water for one minute caused a loss of about 35% of the ascorbic acid in peas. After freezing no further loss was observed in peas stored for eleven months at -17.8° C Samples of commercial frozen peas on the market contained from 0.12 to .23 milligrams of ascorbic acid per gram. Frozen peas after cooking retained important amounts, 40 to 50% of the ascorbic acid present in the fresh peas. The processes of blanching and preparing for freezing destroyed 30% and cooking 10 to 20%. Cooking caused little or no actual destruction of the vitamin, but some ascorbic acid was dissolved in the cooking water. Fresh peas were somewhat higher in ascorbic acid since they had not undergone the scalding and freezing process. Peas cooked in a non leach steamer retained a higher percentage of the original ascorbic acid than those cooked in boiling water. Increasing the amount of the cooking water increased the solubility losses of the ascorbic acid. Thirty-five references.

C. A. 36, 6258 (1942).

(1495) Todhunter, E. N. and Robbins, R. C., "Ascorbic Acid Content of Red Raspberries Preserved by the Frozen Pack Method." Food Research 6, 432 (1941). - The guinea-pig assay gave lower values than were obtained by the indophenol titration. Values for ascorbic acid expressed as milligrams per gram in varieties are: Antwerp 0.35, Washington 0.21, Latham 0.16, Cuthbert 0.17-0.19, Lloyd George 0.14, Marlboro 0.18-0.19 and Tahoma 0.17. Seasonal differences were slight. The addition of sugar to raspberries before freezing had some protective action on the ascorbic acid content. Comparison of fresh and frozen pack raspberries of the same harvesting showed little difference in ascorbic acid content on the moist weight basis, but when calculated on the dry-weight basis the fresh berries contained more ascorbic acid.

C. A. 36, 846 (1942).

(1496) Todoroff, A., How to Build and Operate a Locker Plant. St. Louis, Mo.: Meat Merchandising, 1944. - Locker plant industry; typical plants; processing methods; packaging; helpful suggestions.

E. B.

(1497) Tressler, D. K., Marine Products of Commerce. New York: Chemical Catalog Co. (now the Reinhold Publishing Co.), 1923.

(1498) Tressler, D. K., "Chemical Problems of the Quick-Freezing Industry." Ind. Eng. Chem. 24, 682-6 (1932). - Extensive chemical researches form the

the basis of the present frozen foods industry. Serious problems of desiccation, oxidation, leakage on thawing, development of food flavors and odors and enzyme action were given attention. Desiccation and oxidation in present rapid-freezing methods are controlled largely by compact packaging with moistureproof and moisture-vapor proof materials such as cellophane or cellulose acetate. The leakage of moisture from thawed fish was controlled by proper brining of the fillets in a pure salt solution. Objectionable enzyme actions in vegetables are prevented by blanching (precooking) preparatory to freezing. Chemical changes in frozen fruits are prevented by packaging with sweetened juices or sugar syrups. Colloidal research is needed on the physical changes which occur during the freezing and thawing of flesh and plant tissue. Similarly research is urgently needed on the action and control of enzymes at low temperatures.

C. A. 26, 4108 (1932).

(1499) Tressler, D. K., Birdseye, C. and Murray, W. T., "Tenderness of Meat. I Determination of Relative Tenderness of Chilled and Quick-Frozen Beef." Indus. & Eng. Chem. 24, No. 2, 242-5 (1932). - Two methods for estimating the relative tenderness of meat are compared: one employs an instrument constructed from an ordinary tire-pressure gage; the other is a modified N. Y. Testing Laboratory standard penetrometer. After quick-frozen meat was stored one week it was approximately 20% more tender than before freezing.

B. A. 7, 929 (1933).

(1500) Tressler, D. K. and Murray, W. T., "Tenderness of Meat (II)." Indus. & Eng. Chem. 24, No. 8, 890-2 (1932). - Determination of aging Grade A beef required to produce tender quick-frozen product. Before Am Chem. Soc.

E. I. 1932, 1112.

(1501) Tressler, D. K., "Quick Freezing Destroys Parasites of Trichinous Pork." Food Ind. 5, 177 (1933).

(1502) Tressler, D. K., "Changes Which May Occur in Frozen Foods During Cold Storage." Food Ind. 5, 346-7 & 88 (1933). - A general discussion of deteriorative changes in frozen foods due to enzymes, oxidation, hydrolysis and coagulation. Desiccation of such products as poultry and fish is also the cause of serious losses unless controlled.

C. A. 28, 218 (1934).

(1503) Tressler, D. K., "Preventing Changes in Stored Frozen Food." Food Ind. 5, 410, 432 (1933). - Catalase may be used as an index of the activity of other enzymes in vegetables being prepared for freezing preservation. A blanching period sufficient to destroy catalase insures destruction of other deteriorative enzymes during storage. Since fruits cannot be heated, they are best packaged in compact moisture-vapor-proof materials which largely prevent desiccation and oxidation. The addition of sugar also has a protective action. Except for the oxidation of the fat, enzymic action in frozen meats is beneficial and increases tenderness. However, enzymic changes in fish are objectionable in that they produce offensive odors, and may increase leakage. The presence of Ca and Mg salts used in preparing brines is likewise very objectionable.

C. A. 28, 217 (1934).

(1504) Tressler, D. K., "Methods of Freezing Fruits and Fruit Juices." Ice & Refrig. 88, No. 4, 275-7 (1935). - Development of cold pack and introduction of quick freezing methods as means of preserving fruits; markets for frozen fruit; offers important possibilities to fruit growers - Before New York State Horticultural Soc.

E. I. 1935, 912.

(1505) Tressler, D. K., "Freezer Burn on Refrigerated Poultry." Ice & Refrig. 89, 373-4 (1935); U. S. Egg & Poultry Mag. 41, Nos. 9, 33-36; 10, 38-41 (1935). - Freezer burn is caused by uneven desiccation of cold storage poultry. Certain changes in the fats and proteins of the tissues underneath the desiccated areas probably occur simultaneously with the drying out of the tissues. The proteins become denatured and do not readily take up water which has been lost. The fats, being exposed to air, take up oxygen and slowly become rancid. Dipping the poultry in water or in fat before freezing reduces freezer burn, as does also storage in atmosphere of carbon dioxide. An outline for future work on the problem is given.

C. A. 30, 2653 (1936).

(1506) Tressler, D. K. and Evers, C. F., "The Technique of Determining Moisture Vapor Transmission Through Papers and Boards." Paper Trade J. 101, No. 10, 33-5 (1935). - Certain refinements are considered which have been found to increase greatly the accuracy of tests previously used to determine moisture vapor transmission through papers and boards. The modifications include the careful control of the humidity of the test chamber, the bringing of the papers to be tested to equilibrium with the atmosphere of the test chanber, the starting of the test period forty-eight hours after the apparatus is placed in the chamber, the extension of the test period to five days, and the determination of the rate of moisture vapor transmission not only at 21.2° C. but also at a temperature below 0° C. Data, obtained by the modified method, are presented which give the rate of moisture vapor transmission of some moisture proofed transparent papers and boards.

E. M. F.

(1507) Tressler, D. K. and Evers, C. F., The Freezing Preservation of Fruits, Fruit Juices and Vegetables. New York: Avi Publ. Co., 1936.

(1508) Tressler, D. K., Mack, G. L. and King, C. G., "Factors Influencing the Vitamin C Content of Vegetables." Am. J. Pub. Health 26, 905-9 (1936). - Presented before 3rd Annual Meeting of the American Institute of Nutrition, 1936. Factors influencing the ascorbic acid (vitamin C) content of vegetables are: variety, soil and growing conditions, maturity, storage time and temperature, and cooking; also blanching and thawing of frozen vegetables. These vary widely for different vegetables.

F. F.

(1509) Tressler, D. K. and Evers, C. F., "Quick Freezing Becomes a Science" Refrig. Eng. 32, No. 4, 203, 215, 275 (1936). - Review of book entitled "Freezing Preservation of Fruits, Fruit Juices, and Vegetables." Publisher: Avi Publishing Co., N. Y.

E. I. 1936, 954.

1510) Tressler, D. K., "The Freezing Preservation of Oysters." Atlantic isherman 18, No. 6, 8-9 (1937).

1511) Tressler, D. K., Mack, G. L. and Jenkins, R. R., "Vitamin C Content n Vegetables. VII Lima Beans." Food Research 2, 175-81 (1937). - Studies of vitamin C content of Lima beams showed great varietal differences; also variation on a percentage basis according to size of the same variety. Loss occurs during storage and is greater for shelled beans. Approximately one-third of the vitamin C is lost during the usual blanching period of 150 seconds, but this loss could be cut in half if the blanching periods were cut to from 45 to 75 seconds according to size.

F. F.

(1512) Tressler, D. K. and Evers, C. F., "Freezing Preservation of Fruits, Fruit Juices, and Vegetables." Ice & Refrig. 93, No. 4, 286-8 (1937). - Discussion of development of frozen pack, its present state of development and probable future expansion; all food preservation must rest on scientific knowledge; calls for practical knowledge of "safe" temperatures. Before Nat. Assn. Practical Refrig. Engrs.

E. I. 1937, 980.

(1513) Tressler, D. K., "Quality Control Vital to Success in Frozen Foods Industry." Food Industries 10, No. 6, 320-3, 357-9 (1938). - How control in frozen foods industry can be established and carried out.

E. I. 1938, 1023.

(1514) Tressler, D. K., "Simple Methods for Preparation and Freezing of Fruits and Vegetables Intended for Storage in Lockers." Ice & Refrig. 94, No. 4, 301-3 (1938). - Selection, preparation, packaging, and freezing of vegetables and fruit.

E. I. 1938, 1023.

(1515) Tressler, D. K., "Freezing of Fruits and Vegetables in Lockers." Refrig. Eng. 36, No. 4, 233-5 (1938). - General principals of preparation and freezing fruit and vegetables; future of storage lockers. From N. Y. State Agri. Experimental Sta. - J. paper No. 287 Aug. 31, 1938.

E. I. 1938, 264.

(1516) Tressler, D. K., "Bacteria, Enzymes and Vitamins - Indices of Quality in Frozen Vegetables." Refrig. Eng. 36, 319-21 (1938). - A low bacterial count on a frozen vegetable indicates that the product has been prepared and packaged in a satisfactory manner and that it has not defrosted at any time during storage, transportation or marketing. The absence of enzymes, catalase and peroxidase, is an indication that the vegetable has been sufficiently blanched and will not develop off flavors not lose its color during storage at 0° F. or lower during a period of one year. A normal or high vitamin C content is good evidence that the vegetable was not over mature at time of harvest and that the vegetable was properly handled during blanching and other operations preparatory to freezing and further that the frozen product has been stored at a sufficiently low temperature, viz., 0° F. or lower.

C. A. 33, 5931 (1939).

(1517) Tressler, D. K. and DuBois, C. W. Freezing and Storage of Foods in Freezing Cabinets and Locker Plants. New York State Agric. Exp. Sta. Bulletin No. 690, 1940. 60 pages. - Frozen food locker plants have been recently introduced into N. Y. State. The most successful are those offering meat cutting, packaging, and freezing, and also fruit and vegetables preparation, packaging and freezing services. Freezing cabinets are now being offered which are suitable for the freezing and storage of foods on farms. The cabinets here tested have a small compartment which may be maintained as low as -10° F. to be used for freezing foods: when frozen the foods are transferred to a 0° F. compartment. All foods must be packaged in moisture proof and vapor proof wrappers or cartons. The packaged products should be promptly and quickly frozen at the lowest temperature available. Use of fans for accelerating freezing is suggested. General directions are given for the cutting, packing, and freezing of beef, veal, lamb, pork, poultry, game, fish and shell fish. Fruits to be frozen should be of the proper variety and maturity. The results of studies of the varietal adaptation of fruits to freezing are summarized in tabular form. Fruits must be packed with sugar or syrup to prevent loss of flavor and to retard browning. Detailed directions are presented. Great care must be taken in the selection of the proper variety and maturity of vegetables to be frozen if a first-class product is to be obtained. All vegetables must be thoroughly cleaned and then scalded with boiling water or steam. The scalded vegetables must be thoroughly cooled immediately after scalding, and then should be promptly packaged and frozen rapidly. A selected list of varieties found to give good frozen products is presented. Detailed directions are given for the freezing of all vegetables commonly grown in New York State which give satisfactory products. Frozen foods need no special preparation for cooking.

B. A. 14, 1453 (1940).

(1518) Tressler, D. K., "Preparation for Freezing." Section in Refrigerating Data Book II, Fifth Edition. New York: Am. Soc. of Refrig. Engrs., 1940. Vol. II, pp. 13-18. - Tables of vegetables for freezing giving type, variety best suited, maturity desirable, best scalding medium, optimum blanching period, quality of frozen product. Table of fruits for freezing giving type, best varieties, method of preparation, type of pack. Discussion of preparation of vegetables, fruits, meats, eggs and poultry.

F. F.

(1519) Tressler, D. K., "The Reasons for Quality Control of Quick Frozen Foods." Fruit Prod. Jour. 20, No. 3, 76-77, 87, 89 (1940). - A discussion of commercial process management emphasizing the necessity for research and semicommercial packs before large-scale production is attempted.

B. A. 17, 1167 (1943).

(1520) Tressler, D. K., "Packages and Packaging Materials for Quick Frozen Foods." Quick Frozen Foods 2, No. 7, 12-42 (1940).

(1521) Tressler, D. K., "Freezing Foods on Farms." Refrig. Eng. 40, No. 1, 30-1 (1940). - Locker storages are only partially filling farmer's needs; farm freezers will fill needs of those who cannot advantageously use cold storage lockers; types of farm freezers; points to be considered by purchasers of freezing cabinets. Bibliography.

E. I. 1940, 1022.

(1522) Tressler, D. K., "Freezing Fruit with Corn Syrup." Western Canner and Packer 32, No. 13, 42-3 (1940).

(1523) Tressler, D. K., "A Plea for Research." Refrig. Eng. 41, 251, 262 (1941). - An address by Dr. Tressler in which he stresses the need for knowledge of new processes; use of lower temperature, higher humidities, controlled atmospheres, all related to the refrigeration art. Thus, through research to determine how present practice in freezing may be improved, and future advances made through the establishment of an institution of research.

E. M. F.

(1524) Tressler, D. K. and DuBois, C. W., "The Freezing and Storage of Food in Freezing Rooms and Cold Storage Lockers." Zeit fuer die Gesamte Kalete Industrie 48, No. 3, 46-52 (1941). - Freezing and storage of foods in freezing cabinets and lockers; review of locker practice and results of experiments on suitability of various kinds of food products for freezing and cold storage. German abstract from Bulletin 690, New York State Agriculture Experiment Station. (Abstract No. 1517).

E. I. 1941, 261.

(1525) Tressler, D. K. and Evers, C. F. The Freezing Preservation of Foods. New York: Avi Publishing Co. - Cf. Chem. Eng. News. 21, 344, (1943). Book devoted to freezing preservation of all types of foods: vegetables, fruits, meats, poultry, shellfish and fish, and precooked foods. Methods of preparation, freezing, storage and thawing. Sanitary control. Bibliography following each chapter.

F. F.

(1526) Tressler, D. K., "Home Fruit Freezing." Amer. Fruit. Grower 64, No. 9, 6-7 (1944). - During the war, the price of fruits is probably too high to encourage home canning. However, due to the fact that frozen fruits are in some cases superior to the canned product, it is probable that many housewives will freeze fruit if facilities are at hand. Fruits desirable for freezing include the cranberries, currants, gooseberries, red tart cherries, blueberries, and raspberries. Peaches and strawberries are changed somewhat in appearance, texture, and flavor by freezing, but when thawed they are exceptionally good. Frozen apples and plums make excellent pie stock. Fruits which are undesirable when frozen are grapes, pears, and blackberries. Bananas darken considerably. Whole citrus fruits do not freeze well, but citrus juices are satisfactory for this purpose. Some varieties of fruits freeze better than others. The Duke cherry is excellent but the Napoleon and other sweet cherries darken considerably during freezing and thawing. The J. H. Hale, Halehaven, and Southhaven peach varieties are superior. The Cuthbert raspberry is a superior variety for freezing. Tree-ripened firm uninjured fruits are best for freezing. There will be a wide use of home freezers and rented lockers after the war. Two distinct demands on the fruit growers of the country are anticipated: (1) for varieties of berries and peaches which will give an especially desirable frozen product; (2) for increased quantity of frozen fruits and vegetables, by consumers.

B. A. 19, 380 (1945).

(1527) Tressler, D. K. and Dubois, C., "No Browning of Cut Fruit when Treated by New Process." Food Industries 16, No. 9, 701, 763-5 (1944). - Ascorbic acid in solution prevents browning and flavor loss in easily oxidised fruits when cut for use in baking or for freezing or canning; treatment described which does not affect flavor, and adds to the nutritive value.

E. I. 1944, 416.

(1528) Tressler, D. K., "Packaging of Foods for Freezing." Fruit Prod. J. 24, No. 4, 106-7, 123 (1944). - From a discussion of the best available package for each class of frozen commodity and from data on storage life of frozen foods it appears that the ideal package for all types does not exist. Such a container should be liquid-tight, waterproof, moisture vapor proof, air-tight, and grease-proof, and should not be stained by blood or fruit juices; it should be inexpensive, strong, easily filled, easily sealed, easily labeled and rectangular or cubical.

B. A. 19, 885 (1945).

(1529) Tressler, D. K., "What's Ahead for Frozen Foods?" Adv. & Sell. 38, 39 (1945). - A discussion of the frozen food locker plant, its history and improvements with the advantages it offers in services and facilities to the people. With the development of the home freezer and the larger farm freezer more people are taking advantage of frozen food processing and these developments tend to supplement - but not replace - the frozen food locker plant.

E. M. F.

(1530) Tressler, D. K., "Problems in Freezing Foods." Agric. Eng. 26, No. 1, 13-14 (1945). - If home freezing of foods is to be popular, the methods must be simple and practical and the quality of the food must be high. Problems connected with the freezing of meats, dairy products, fruits and vegetables are considered.

B. A. 19, 1113 (1945).

(1531) Tressler, D. K., "Importance of Quality Control to Frozen Foods." Canner 101, No. 3, 18-9 (1945). - Quality control dependent not only upon freezing method employed, but also on the care taken in selection, handling and preparation of product, and low temperature maintenance after freezing. Importance of plant location and proper sanitary measures are discussed.

F. F.

(1532) Tressler, D. K., "Plant Breeding (for Freezing) Pays Big Dividends." Frosted Food Field 1, No. 5, 17 (1945).

(1533) Tressler, D. K., "Use of Frozen Fruit Purees." Frosted Food Field 1, No. 6, 6 (1945). - Used in soda fountain syrups, flavoring soft drinks, and puddings, making ice creams and ice cream sauces, and in "Velva Fruits". Crushed and pureed fruits hold their flavor better than fruits which have not been crushed prior to freezing.

F. F.

(1534) Tressler, D. K., "War's End Brings Improvement in Frozen Foods Packaging." Fruit Prod J. and Am. Food Mfgr. 25, No. 1, 3-4 (1945). - Rubber latex bags, pliofilm, and rubber composition coatings will be obtainable. Pliofilm better than cellophane for it has greater flexibility at low temperatures. The rubber coatings (a mixture of rubber and wax compositions) are highly moisture-vaporproof and heat-seal much better than those of wax alone. Cellophane, too, will be improved, with new grades becoming available which will be tougher and less brittle. American Can Co. development of a composite fiber-metal can resembling the conventional twelve-oz. frozen food carton in shape - walls are of paraffin impregnated fiberboard and ends of lightweight tinplate. It requires no inner lining and has many other economic advantages.

F. F.

(1535) Tressler, D. K., "Quality Control in the Frozen Foods Industry." Ice & Refrig. 109, No. 3, 54 (1945).

(1536) Tressler, D. K., "Frozen Food Processing as Allied to Home Freezers and Locker Plants." Refrig. Eng. 50, No. 4, 342 (1945). - Digest of paper presented at Twin City Meeting of A. S. R. E. Historical review of developments of locker plants; steps in preparing meat, fruit, and vegetables for freezing; importance of proper packaging; storage temperatures; future for freezing precooked foods.

F. F.

(1537) Tressler, D. K., "Home Freezers - Present and Future (Parts I and II)." Refrig. Eng. 49, No. 2, 97-102, 120; No. 3, 194-7 (1945). - Presented before the 40th Annual Meeting of The American Society of Refrigerating Engineers, 1944. Part I is the report of a detailed study of home freezers: prewar types, freezing temperatures, storage temperatures, standards, quality of frozen foods in home freezers, hazards of home freezing, thawed fruits, meats poultry and fish, and postwar outlook are topics discussed. Part II presents the discussion of the paper by members of the society.

F. F.

(1538) Truscott, J. H. L. Resume' Frozen-Pack Test of Fruits and Vegetables. Ontario Agriculture College, Mimeographed Report, 1938.

(1539) Truscott, J. H. L., Frozen Pack Preservation Variety Tests - Fruit and Vegetables. Ontario Agricultural College, Department of Horticulture, Mimeographed Circular, 1942.

(1540) Tuchschneid, M. V., "Weight Losses in Cold Storage." Ice & Refrig. 89, No. 6, 375 (1935). - Russian experimental study of physical and biochemical changes taking place in freezing of perishable foodstuffs, particularly meat, fish, poultry, eggs, butter, fruits and vegetables. From Kholodilnoe Dielo.

E. I. 1935, 239.

(1541) Tucker, L. R., "Fruit Juice Concentration by Freezing and Centrifuging." Proc. Am. Soc. Hort. Sci. 38, 225-30 (1941). - The development

and pattern of ice crystal formation in sugar solutions and fruit juices was studied and a method was developed for small scale commercial concentration of fruit juices. A centrifuge developed for use in this process is shown. Juices of thirteen kinds of fruits were concentrated and their suitability for such determined. The degree to which fruit juices, especially those heat extracted, could be concentrated by this method was more often limited by the viscosity than by the total amount of soluble solids of the juices. A pectin-destroying enzyme, used on cooked blueberry juice, reduced the viscosity enough to remove this factor of limitation to the concentrating process.

B. A. 15, 2080 (1941).

(1542) Tucker, W. R., "Quick Freezing and Marketing." Refrig. Eng. 20, No. 3, 149-50 (1930). - Proper methods of fruit preservation for marketing.

E. I. 1930, 1500.

(1543) Tucker, W. R., "Frozen Assets Proven Profitable by Georgia Peach Growers." Ice & Refrig. 80, No. 1, 51-2 (1931). - Progress of preserving tree-ripened peaches by quick-freezing process; experiments in 1929. Before Frozen Foods Conference.

E. I. 1931, 1206.

(1544) Turley, L., "The Job of Packaging Frozen Foods." Quick Frozen Foods 7, No. 10, 48-9 (1945). - Techniques of wrapping steak, fowl, ground meat, fish, and small game for freezing in locker plants are described and illustrated.

B. H. W.

(1545) Ullrich, H., "Alteration of the Structure of Gels by Freezing." Kolloid - Z. 96, 348-53 (1941). - Freezing of gelatin solution shifted the pH value toward the isoelectric point; the shift was proportional to the gelatin concentration. After being frozen, the gelatin had a higher softening point; the greatest increase in softening point occurred at the isoelectric point. Honeycombed and filamentous structures were formed having specific double refraction. With agar the pH change was inversely proportional to the logarithm of the concentration; at pH 5.8 no change at all took place. Freezing caused agar solutions to assume a filamentous structure; double refraction was observed which varied with the concentration but was independent of the pH. When a pectin gel is thawed after being frozen, it liquifies.

C. A. 37, 21 (1943).

(1546) Vail, G. E., "Effect of Processing Upon the Nutritive Value of Food." J. Am. Dietet. Assoc. 18, 569-74 (1942). - Review of the literature on the effects of storage, preparation, cooking, freezing and canning on food.

C. A. 37, 187 (1943).

(1547) Vail, G. E., Jeffrey, M., Forney, H., and Wiley, C., "Effect of Method of Thawing Upon Losses, Shear, and Press Fluid of Frozen Beef Steaks and Pork Roasts." Food Res. 8, No. 4, 337-342 (1943). - Thawing beefsteaks and pork roasts at room temperature, at refrigerator temperature, and in the oven gave similar results. Steaks and roasts thawed at oven temperature were slightly less tender and required a longer cooking time than those thawed by the other two methods. Steaks and roasts thawed at room temperature yielded the least press fluid and roasts thawed at room temperature had the highest percent of total loss.

B. A. 18, 39 (1944).

(1548) Valeriti, E., "Nutritive Value of Frozen Meat." Giorn. R. Soc. Ital. Igiene. Zentr Biochem. Biophys. 16, 656 (1913). - Experiments showed that frozen American meat contained more water and salts than fresh Italian meat; these results are opposed to those of Gauthier and V. Accoli-Silvestri. Comparison of the values obtained before and after freezing (storage at -10° for forty days) showed that the concentration of dry residue and nitrogeneous substances was increased, while the water content was diminished. It is probable that the results may vary with slow, gradual thawing of meat.

C. A. 8, 3209 (1914).

(1549) Van Duyne, F. O. Home Preparation of Fruits and Vegetables for Freezer Storage. Univ. of Ill. Ext. Service, HE-P27. 4 pages.

(1550) Vetter, H., "New Tables of Specific Heats." Refrig. Eng. 31, 174 (1936). - List of some specific heats used in refrigeration engineering.

W. B. C.

(1551) Vickery, J. R., "Refrigeration of Meat. II Freezing of Beef and Mutton Press Juices." Australian J. Exptl. Biol. Med. Sci. 3, 81-7 (1926). - The determination of the amounts of unprecipitated N before freezing and after thawing showed that a fairly complete reconstitution of beef juice was obtained with rates of freezing which gave latent periods of three hours and under. This reconstitution was aided by slow thawing. The results of tests on mutton juices were much the same as those for beef. Ultramicroscopic examination of beef juice showed that the freezing and thawing cycle had caused a large reduction in the numbers of single colloidal particles. The higher the rate of freezing, however, the less was the reduction. Mutton press juices, unlike beef juice, showed very little diminution in the numbers of single colloidal particles, but the variation of the rates of freezing from 0.3 hr. to 3 hours did not produce any material alteration in the numbers. The results of the two methods may be reconciled by supposing that during the freezing process the colloidal particles of beef juice may have formed small aggregates, which would not be precipitated by centrifuging. Apparently the changes which take place during the freezing of beef are largely determined by alterations in the sarcolemma of the muscle during freezing.

C. A. 20, 3319 (1926).

(1552) Vickery, J. R., "Rapid Freezing of Foodstuffs." Cold Storage 37, No. 435, 141-2 (1934). - Author discusses efficacy of methods and whether or not results justify cost; meat products; testing flavor; fish and fruit; concludes that with possible exception of peaches; it still remains to be proved that rapid freezing of fruits possesses any real advantages as far as quality of thawed product is concerned. Before Victorial Inst.

E. I. 1934, 931.

(1553) Vogt, C. W., "Developing Equipment for Quick-Freezing and Chilling." Food Ind. 4, No. 4, 132-5 (1932). - Factors pertaining to quick-freezing and chilling of plastic and non-plastic food products; advantages of quick chilling; developments in freezing equipment.

Refrig. E. I. 1932, 1111.

(1554) Wade, B. L. Snap Beans for Marketing, Canning, & Freezing. U. S. Dept. Agric., Farmers' Bull. 1915, 1942.

(1555) Wadsworth, H. I. and Wilcox, E. B., "Effect of Home Cooking Practices on the Ascorbic Acid Content of Frozen and Canned Lima Beans." Jour. Amer. Diet. Assoc. 21, No. 5, 289-290 (1945). - Fresh Lima beans averaged 27.9 milligrams ascorbic acid per 100 grams; 2½ minutes of blanching in steam caused a loss of 28%; the canned product retained 49% but marked losses occurred with ten minute boiling or holding 24 hours in the cold and reheating. Frozen beans retained more than the canned product. Sodium bicarbonate ($NaHCO_3$) (0.22 grams to 75 mililiters of water, $_pH$ 8.3) did not affect the retention.

B. A. 20, 50 (1946).

(1556) Wagner, W. and Steiner, G. K., "Investigation Concerning Preservation of Meat in the Karlsruhe Abattoir." Ziet Fuer Die Gesamte Kaelte - Industrie 43, No. 1, 18-9 (1936). - Brief note on investigation of preservation of meat in Karlsruhe Abattoir, Germany; advantages of rapid and low-temperature cooling pointed out.

E. I. 1936, 247.

(1557) Wallace, G. I. and Tanner, F. N., "Microbiology of Frozen Foods." Fruit Prod. J. & Am. Vinegar Indust. 13, No. 2, 52-4, 56; No. 4, 109-113 (1933). - A very comprehensive review of the literature on the effects of freezing on bacteria, yeasts, and molds, with extensive bibliography.

B. A. 8, 2274 (1934).

(1558) Wallace, G. I. and Park, S. E., "Microbiology of Frozen Foods. IV Longevity of Certain Pathogenic Bacteria in Frozen Cherries & Frozen Cherry Juice. V The behavior of Cl. botulinum in Frozen Fruits and Vegetables." J. Infectious Diseases 52, No. 2, 146-9, 150-6 (1933). - IV. Bacillus Coli, Proteus vulgaris, Salmonella Aertrycke, S. Schottmuelleri, and Eberthella typhi were frozen in canned cherries and in cherry juice at -17.8° and -40° C. In juice, the organism survived less than 4 weeks; in canned cherries, 2 to 3 months. V. Toxin and spores of Cl. botulinum (types A and B) were frozen in cherries, strawberries, raspberries, green beans, carrots and peas at -16° for 1 year. In no case was the toxin destroyed; spores were viable, but growth from germinated spores in all cases seemed unable to produce toxin. Toxin was found more often in vegetables than fruits, although there was growth in all cases. Presence of other microorganisms may influence toxin production. Occasionally a frozen, atoxic spore suspension became toxic during freezing. Apparently, toxin is not produced in the time elapsing between canning and freezing.

B. A. 8, 991 (1934).

(1559) Wallace, G. I. and Tanner, F. W., "Microbiology of Frozen Foods. 2. Studies on Frozen Fruits and Vegetables." Fruit Prod. Jour. & Amer. Vinegar Indust. 13, No. 9, 274-277 (1934); No. 12, 366-369, 377 (1934); 14, No. 5, 145-7, 151 (1935). - The authors examined about 2000 cans of frozen foods, including cherries, strawberries, peaches, black raspberries, goose-

berries, green beans, wax beans, Lima beans, corn and peas, packed under various conditions, to obtain information on the desirability of the frozen pack process. Certain varieties of fruit withstand freezing better than others and best quality raw material should always be used. Tin cans give the best products. These observations are less true for vegetables. Vacuum packing seems especially desirable for these products. The food should be carefully prepared, frozen immediately after packing, kept frozen until ready for consumption and used very soon after thawing. The microorganisms count is rather high at time of packing and decreases steadily through the holding period. After one year's storage the decrease is very slight. Some of the cans examined after more than three years' storage contained viable organisms. Cans allowed to stand at room temperature after storage for three years spoiled quickly. The numbers of yeasts and bacteria decrease faster than molds. The microorganisms do not seem to affect the quality of the food and probably are unimportant, provided the food is kept frozen until ready for consumption. Freezing causes great destruction of the tissue cells. In the vegetables packed in brine solution, tissue destruction was much less than when packed in water or dry-packed.

B. A. 9, 1815 (1935).

(1560) Walther, R. C., "Methods of Quick Freezing Tray and Conveyor Freezers for Loose Fruits and Vegetables." Refrig. Eng. 41, 1-6 in sec. 22 (1941). - A lengthly description of the methods and steps in quick freezing taking in detail such topics as: classification by form, classification by cooling media, preparation by blanching, use of air for freezing, coil units and defrosting, loose freezing systems, and freezing in stages.

E. M. F.

(1561) Warner. Cold Storage Lockers for Preserving Farm-Dressed Meat. U. S. Department of Agriculture, Bureau of Animal Industry, Circular A.H.D. No. 16 (revised), 1938.

(1562) Warner, "Frozen Food Lockers in the South." Quick Frozen Foods 3, No. 4, 12, 41 (1940).

(1563) Warner, D. K., "Frozen Brine Refrigeration." Ice & Refrig. 79, 126-7 (1930).

(1564) Warrington, S. T. Frozen Food Locker Plants in the United States. U. S. D. A., Farm Credit Admin., Washington, D. C., Misc. Rept. No. 41, 1941. 48 pages. - Analysis of locker plant capacities and rentals; farm and non-farm patronage; services; rentals and rates; volume of sales; curing and fruit and vegetable processing.

E. B.

(1565) Warrington, S. T. Operation of Cooperative Frozen Food Locker Plants in Illinois. U. S. D. A., Farm Credit Admin., Washington, D. C., Sp. Rept. No. 77, 1941. 38 pages. - Survey of investment, operating costs, income of locker plants; labor and management, etc.

E. B.

(1566) Warrington, S. T., "Economics of Locker Plant Operation." Refrig.

Eng. 42, No. 5, 309-12 & 319 (1941).

(1567) Waters, L. W., "Development of the Quick-Freezing Process." Chem. Eng. News 20, 1559-61 (1942). - In 1931 10 stores in one New England city sold frosted foods; in 1942 35,000 stores throughout the country sold some 400,000,000 pounds of such products as fish, meats, poultry, fruits and vegetables. Quick-freezing preserves natural taste and maximum vitamin content indefinitely. Success comes from minimizing crystal formation during freezing; the quicker the freezing, the smaller the crystals. The zone of optimum crystal formation was determined experimentally to be between 31° F. and 25° F., about 75% of the total water content being then frozen. Freezing machines have doors front and back, with multiple plates of aluminum alloy placed one above another and provided with curved passages through which the refrigerant passes. Maximum utilization of waste products is an important factor in successful operation.

C. A. 37, 953 (1943).

(1568) Watkins, J. E., "Case for Blast Freezing of Poultry and Other Shrinkable Food Products." Ice & Refrig. 105, No. 3, 93-7 (1943); Modern Refrig. 46, No. 546, 210-1 (1943). - Most desirable temperatures for freezing dressed poultry are determined from consideration of economic factors entering into process; cost of operation and maintenance of equipment, cost of handling, shrinkage or dehydration of products, rate of freezing, and physical condition of frozen product, contribute toward choice of "most desirable" temperatures; more pertinent of these points considered.

E. I. 1943, 897.

(1569) Watson, G. A., "T.V.A. Sponsored Plant Employs Immersion and Spot Freezing." Refrig. Eng. 46, No. 4, 240-1 (1943); Food Industries 15, No. 10, 66-8 (1943). - Two different freezing processes are used by Dixie Frosted Foods Co. in quick freezing plant in operation at Georgetown, Ala.; designed with technical assistance of T.V.A., plant has capacity of 25 tons per day of processed foods; refrigeration equipment and procedure.

E. I. 1943, 896.

(1570) Weddell, G. O., "Cooling Storage Rooms by Brine Spray System." Food Industries 14, No. 9, 59-61; No. 10, 56-58 (1942). - Method introduced where rapid precooling, followed by holding at steady temperature, is desired, has improved results in apple storage. Article forecasts combination with quick freezing of fruits and vegetables.

E. I. 1942, 236.

(1571) Weiss, H. B. and Isaacs, R., Manual of Clinical on Laboratory Technology. Philadelphia and London: W. B. Saunders Co., 1937. - Has section on food analysis.

F. F.

(1572) Wendler, A. F., "Cellophane for Food Conservation Under War Needs." Proc. Inst. Food Tech. 1942, 144-7. - The use of cellophane aids materially in conserving strategic metals such as Pb, Sn, and Fe in the packaging of certain foods. There are many types of cellophane, each designed for a special purpose. Moisture- and vapor-proof cellophane are particularly useful in wrapping frozen foods.

C. A. 37, 953 (1943).

(1573) Whitacre, W. R. Facilities & Services of Pennsylvania Freezer-Locker Plants. Penn. State Col. Ag. Exp. Sta. Bulletin 433, 1942. 13 pages.

(1574) White, W. H., "XVII Rancidity in Pork Fat After Frozen Storage and Conversion to Bacon." Can. J. Research 19-D, 96-103 (1941). - Determination of the peroxide O_2 and free fat acid content of the fat of pork, stored under various conditions and subsequently converted to bacon, showed that temperature, method of wrapping, and stage in the conversion to bacon were the most important factors governing the oxidation and hydrolisis of the fat. Of the conditions studied, storage temperatures of -18° C. to -23° C. with an Al foil wrapping, followed by thawing in brine or pickle were the most effective in retarding rancidity. The greatest increase in the peroxide O_2 content occurred during cure, whereas that of free fat acid increased at a relatively uniform rate throughout the various conversion steps. Smoking had greater antioxidant effect on the fat than pale-drying. Since in all instances the content of the free fat acid was low, spoilage in pork or bacon fat is primarily due to oxidation.

C. A. 35, 3350 (1941).

(1575) White, W. T. S., "Development of Frozen Poultry." Ice & Refrig. 91, No. 3, 211-4 (1936). - Cold drawn and quick frozen methods used by Sherman White & Co., Fort Wayne, Ind.

E. I. 1936, 953.

(1576) Whyte, H. T., "The Transportation of Quick Frozen Foods." Refrig. Eng. 38, 274-6 (1939). - Described in this article is an important development in refrigerated rail transport, the research carried on to find a properly designed car for quick frozen foods. Heavier insulation is used in designing these cars, and marked progress has been made in methods of loading and icing them to secure desired conditions during transit. Along with this is the development of portable frozen food containers of various sizes for the successful transportation of quick frozen foods.

E. M. F.

(1577) Wiant, D. E., "Results of a Farm Survey of Frozen Food Units." Agric. Eng. 25, No. 5, 183-4 (1944). - Survey conducted to determine size of cabinet that users are buying, and why, whether it is homemade or manufactured, its location, nature and proportion of products frozen, whether chilling room is believed necessary and whether unit is giving satisfaction.

B. A. 18, 2020 (1944).

(1578) Wiegand, E. H. The "Frozen-Pack" Method of Preserving Berries. Ore. Agr. Expt. Sta. Bulletin 278, 1931. pp. 5-42. - Temperatures of -12° to -17° were very suitable for the freezing of berries. Lower temperatures did not give better results. Sirup concentrations of 40 - 60% sugar gave the best results for packing berries for freezing. The use of Sn cans with a vacuum seal effectively prevented surface oxidation and discoloration. Precooling of the fruit before packing is recommended.

C. A. 26, 4387 (1932).

(1579) Wiegand, E. H., "Frozen Pack Method of Preserving Berries." Ice &

Refrig. 81, No. 6, 469-70 (1931). - Summary of bulletin issued by Agricultural Experiment Station, Oregon State Agricultural College; berries packed under old method lack color, firmness and flavor; harvesting and handling precooling; cold-storage quick freezing; usual freezing temperatures.

E. I. 1931, 310.

(1580) Wiegand, E. H., "Maintenance of Quality in Barreling Berries." Canning Age 13, 205-6, 218 (1932). - Cf. Ore. Agr. Expt. Sta. Bull. 278, 5 (1931). Sucrose is far superior to dextrose as a preservative in frozen berry packs. Opportunity must be given during packing to allow the sugar to go into solution; otherwise an inferior pack results. Fine-grained sugars are superior to course-grained.

C. A. 26, 5155 (1932).

(1581) Wiegand, E. H. Preservation of Fruits and Vegetables by Freezing. Ore. Agr. Expt. Sta. Circ. 116, 1936. pp. 3-11. - A preliminary scald or blanch is necessary for the successful freezing preservation of most vegetables. The blanch removes gases, saturates the tissues with water, inactivates enzymes and minimizes discoloration and deterioration in storage. By packing fruits and vegetables in brine or sirup, these products are protected from air and retain their quality better than without brine or sirup. Methods are detailed for the freezing preservation of the more common fruits and vegetables. C. A. 30, 7234 (1936).

(1582) Wiegand, E. H. Experimental Results on the Preservation of Fruits and Vegetables by Freezing. Progress Report. Ore. Agri. Expt. Sta. Circ. 122, 1937. pp. 3-13. - Methods for the preparation of fruits and vegetables for freezing are described. Both dry sugar and 50% sugar sirups are satisfactory for preserving fruits for freezing. A 2% NaCl brine was most satisfactory for freezing vegetables. Blanching of vegetables in steam or hot water to check enzyme activity is necessary to prevent the development of discolorations or off flavors. Rapid freezing is essential at temperatures from 5° to -5° F. A temperature of 15° F. should never be exceeded for storage of frozen fruits and vegetables.

C. A. 31, 6367 (1937).

(1583) Wiegand, E. H., Oliver, A. W., and Case, L. A. Food Preservation by Freezing. Oregon State Col., Corvallis, Ore., Ext. Bull. 593, 1942. 12 pages.

(1584) Wiegand, E. H. Freezing Fruits, Vegetables, and Meats. Oregon Agriculture Experiment Station Extension Circular 366.

(1585) Williams, "Protection of Quick Frozen Foods Vital in Markets and Homes." Locker Operator 7, No. 2, 11, 36 (1945).

(1586) Williams, E. W., "The Frozen Foods Industry to Date; Its Past and an Analysis of Its Future." Quick Frozen Foods 7, No. 7, I-IV. - Excerpts from a talk before the N. Y. Society of Security Analysts. According to the author, about 600-650 million pounds of fruits and vegetables were frozen in 1944, plus about 90 million pounds of poultry and an equal

amount of seafoods. Figures for vegetables and fruits are given for 1937 (150 million pounds) to 1945 (estimated, 700-800 million pounds). In 1944 there were 400-450 frozen food processors (expected to grow to 2,000 in 3-4 years), packaging over 50% of products for the retail trade. About 25-30 package more than 1 million pounds annually. Figures on retail trade are given, also those on costs. Potential entries into the field are discussed; canners are among these. Quick-frozen meats are said to offer one of the greatest opportunities. A discussion of low-temperature cabinets is also included, in addition to one on locker plants. Electronic defrosting is mentioned.

B. H. W.

(1587) Williams, E. W., "The Big Need is for Volume Packaging Equipment." Quick Frozen Foods 7, No. 10, 41-43, 59 (1945). - The packaging line is said to be the bottleneck in many freezing plants, where much manual work makes it difficult to maintain the high handling speed necessary to maintain quality. Various packaging machines and materials are described, including machines for wrapping, bag making, filling, sealing, etc.

B. H. W.

(1588) Williams, E. W., "Need of Complete Frozen Food Protection Emphasized." Quick Frozen Foods 8, No. 2, 48-9 (1945). - Carelessness or ignorance in handling frozen foods in markets or home may endanger quality of product and lead to spoilage. Author issues warnings to grocers and housewives. Suggests education of grocers so that they may explain proper handling to customers.

F. F.

(1589) Williams, I. L. and Funk, E. M. Factors Affecting Temperature Change in Dressed Poultry During Refrigeration. Missouri Agriculture Experiment Station, Research Bulletin 334, 1941.

(1590) Williams, J. and Corran, J. W., "The Preservation of the Antiscorbutic Vitamin in Lemon Juice." Biochem. J. 24, 37-50 (1930). - Experiments on preserving lemon juice - various preservatives tested for their effect on vitamin C and effectiveness in maintaining flavor. It is pointed out that vitamin C is particularly unstable under conditions detrimental to growth of microorganisms.

F. F.

(1591) Williams, P. M., "Standards for Frozen-Pack Fruits." Canner 90, No. 9, 16-18 (1940). - Cf. "Standards for Quick Frozen Foods" in Quick Frozen Foods 3, No. 7, 26, 40-41; Western Canner & Packer 34, No. 8, 43-44.

(1592) Williams, W. J., "Ottesen Freezing Process Applied to Meat, Poultry, Rabbits, Etc." Ice & Refrig. 69, No. 1, 47-8 (1925). - Results of experiments carried on in municipal cold storage plant in Australia.

E. I. 1925, 623.

(1593) Williams, W. J., "The Cold Storage of Vegetables." Ice & Refrig. 87, 179-80 (1934).

(1594) Williams, W. J., "Cold Storage of Fruits and Vegetables - Precooling and Post Cooling." Ice & Refrig. 89, 285-7 (1935). - Precooling and post cooling accorded to cold-storage fruit increase markedly the keeping quality of the fruit when it has been removed from storage. By precooling is meant the partial cooling of the fruit before it goes to the cold-storage room proper. By post cooling is meant the partial warming up of the fruit when it is taken from the cold-storage room and before it is exposed to ordinary atmosphere conditions.

C. A. 30, 2655 (1936).

(1595) Williams, W. J., "Quick Freezing of Vegetables." Ice & Refrig. 91, No. 4, 298-9 (1936). - Report on present quick freezing practices in Australia; investigation of conditions with recommendations.

E. I. 1936, 955.

(1596) Williamson, E. D. and Adams, L. H., "Temperature Distribution in Solids During Heating or Cooling." Physical Review 14, 99-114 (1919). - Temperature distribution in solids given for various shapes under several conditions: surface heated at uniform rate; surface suddenly cooled or heated. Discussion of thermal diffusity and method of measurement.

F. F.

(1597) Williamson, M. A., "Future of Quick Frozen and Dehydrated Foods." Mod. Pkging. 17, 101-3 (1944).

(1598) Wilmot, J., "Nutritive Value and Frozen Foods." Refrig. Eng. 38, 78-80 (1939). - Losses in vitamin potency, losses in sugar and minerals, and changes in color and flavor resulting from the preparation of foods for freezing, the freezing itself and the defrosting and cooking of frozen food are described.

C. A. 33, 9459 (1939).

(1599) Winter, J. D. and Noble, I. D. Frozen Fruits & Vegetables for Home Use. U. of Minn. Ag. Exp. Sta. Ext. Bull. 200, 1939.

(1600) Winter, J. D., "Strawberry & Raspberry Varieties for Freezing Storage." Proc. Am. Soc. Hort. Sci. 37, 548-52 (1940). - Ratings of 19 varieties of strawberries and 10 varieties of red raspberries for freezing and storage are given on the basis of their value for dessert use after 6-10 months' storage at -10° F. Named varieties found to be most satisfactory for this purpose were Beaver, Culver, Dorsett, Gem, and Wayzata strawberries and Chief, Latham, and Viking raspberries. Difference in the quality of the fresh berries as grown under local climatic conditions were reflected in the different ratings of the frozen berries.

B. A. 15, 540 (1941).

(1601) Winter, J. D., Alderman, W. H., and Landon, R. H., "Conditioning Ice Refrigerated Rooms for Berries with Carbon Dioxide." Ice & Refrig. 99, No. 2, 137-40 (1940). - Holding strawberries in a refrigerated room with an atmosphere containing 30% CO_2 operates to retard spoilage of the fruit. The high CO_2 content prevents the development of microorganisms.

C. A. 35, 6684 (1941).

(1602) Winter, J. D., "Engineering Ingenuity Makes Frozen Foods Promising Industry." Minn. Techno-Log 21, No. 6, 128-9 (1941). - Modern commercial freezing plants are result of new technical engineering practices developed to provide rapid rate of heat transfer in freezing, reduction of moisture vapor losses by means of controlled humidities and proper packaging, rapid handling of large quantities of food and accurate control of other factors go into production of high quality "quick frozen" products.

E. I. 1941, 1026.

(1603) Winter, J. D. Quality in Frozen Fruits & Vegetables. Minn. Agric. Exp. Sta. Bull. 362, 1942. 24 pages. - On the basis of six years' experimental work, recommendations are given for freezing and storing 32 fruits and 75 vegetables. Organoleptic tests showed no marked differences in quality between storage at 0° and 5° F.; in either case there was a marked reduction in the number of microorganisms present. No appreciable difference in quality was produced by different types of commercial containers, by the manner of preparing sucrose syrup, or by use of 2% salt brine as compared to dry pack. Scalding periods for various vegetables were given and no advantage was found in any of several proposed changes in technic. Visible recrystallization of sugar in frozen fruits was prevented by the addition of 25% of enzyme-converted corn syrup; this and honey partly replaced sucrose. Dry pack vegetables stored 10-14 days in icing compartment of a domestic refrigerator lost in quality but not if packed in sugar or syrup.

B. A. 17, 1651 (1943).

(1604) Winter, J. D., "Preparing Fruits and Vegetables for the Frozen Food Locker." Minn. Hort. 70, No. 6, 103-5 (1942). - General directions are given for the preparation and packing of fruits and vegetables and their juices, together with particular instructions concerning cherries, peaches, plums, and various berries. For dry sugar and sirup packs, the proportion of fruit and sugar (or sirup) is tabulated for standard and medium sugar-saving packs, with indication of the amounts of honey or of extra-sweet corn sirup that may be substituted for a portion of the sugar.

B. A. 17, 2417 (1943).

(1605) Winter, J. D. Freezing Fruits and Vegetables. U. Minn. Ag. Exp. Sta. Ext. Folder 111, 1943.

(1606) Winter, J. D. and Hustrulid, A., "What's New in Freezing Foods for Home Use." Minn. Farm & Home Sci. 2, No. 3, 1 & 11-12 (1945).

(1607) Winton, A. L. and Winton, K. B., The Structure and Composition of Foods. New York: J. Wiley & Sons, Inc., 1932-39. 4 volumes. - Structure and composition of most foods presented in detailed and comprehensive manner.

F. F.

(1608) Winton, A. L. and Winton, K. B., The Analysis of Foods. New York: J. Wiley & Sons, Inc., 1945; also published by: London: Chapman & Hall Ltd. - Book of methods of food analysis brought up to date by reference to recent advances published in periodicals: gives equipment needed and step by step directions for a wide variety of analyses, discusses theories and

actors in tests; suggests methods for testing the color, tenderness, juiciness, etc., as well as for substances usually analyzed in foods.

F. F.

1609) Wirtz, F. M. G., "Refrigerating Technology in the Service of Public Health." Zeit Fuer Die Gesamte Kaelte Industrie 46, No. 7, 121-4 (1939). - Refrigeration engineering in service of public health; author recommends conservation of fruit and vegetable crops by freezing directly after harvesting, and offers some suggestions as to how this could be carried out on a smaller and larger scale, by use of portable refrigerating plant.

E. I. 1939, 1005.

1610) Wisely, K. C., "A Nutritionist Looks at Frozen Foods." Quick Frozen Foods 7, No. 5, 36, 54 (1944). - Freezing does not affect the vitamin content of foods. Some vitamin loss may occur in blanching of vegetables, or in improper defrosting or cooking, but freezing preserves more nutritive value than any other kind of food preservation.

B. A. 19, 885 (1945).

1611) Witz, R. L., "Design of Farm Freezing Units." Agric. Engr. 22, No. , 105-6 (1941). - Suggestions for design, construction and operation of rural refrigerating units, including quick freezing equipment; construction and insulation. Before Am. Soc. Agric. Engrs.

E. I. 1941, 1025.

1612) Witz, R. L., "Frozen Food for Farm Folks." Fruit Prod. J. 23, No. , 17-18 (1943). - An average 5-6 cu.ft./member of the family is required f meats, vegetables and fruits are to be preserved; top opening doors are referable to side opening ones. Operating costs were estimated at $3.12/-onth for a family of 4 (24 cu.ft.); home construction of freezing units o fit individual needs can be very practical.

B. A. 16, 264 (1944).

1613) Wolf, J., "Refrigeration and Freezing of Fruits and Vegetables With pecial Reference to Vitamin C Retention." Vorratspflege U. Lebensmittel orsch 4, 241-56 (1941). - The influence of stage of maturity on stability nd the relationship of temperature to changes in ascorbic acid content re discussed. Potatoes held in stacks or in cold storage at 38° C. lose 0% of their ascorbic acid by mid-April, while red and white cabbages held t 0° C. lose none. The loss in ascorbic acid together with changes in lavor and structure that frequently occur in freezing and frozen storage ay be avoided by the destruction of oxidases (blanching), or by exclusion f the oxygen through freezing in a strong sugar solution or in O-free ases.

C. A. 37, 5796 (1943).
C. Z. I, 2338 (1942).

.614) Wolford & Andersen, "Propinates Control Microbial Growth in Fruits, egetables." Food Ind. 17, No. 6, 622-4 (1945).

.615) Wolford, E. R., "Direct Microscopic Method for Estimation of Sanitary History of Frozen Pack Peas." Western Canner & Packer 35, No. 13, 58

(Dec., 1943). - Direct examination method for examining of washings of vegetables is given. This method checks number of organisms (living or dead) and thus gives index to proper sanitation in handling. Step by step explanation is given as well as interpretation of results. There is evidence that freezing storage of the peas (the test vegetable used) has no significant effect on the findings by the test.

F. F.

(1616) Woodbury, G. W., "Selection of Beans and Peas for Processing." Canner 100, No. 8, 48-50 (1945). - Many old varieties are being pushed aside for the new which are chosen by the processor on the basis of color, flavor, and texture. They are also chosen on the basis of adaptability. A good pea for freezing must produce a large number of pods at a given time. In general pea freezers pack larger sized peas including such varieties as Gradus, Thomas Laxton and Alderman. In beans, dark green color, freedom from strings and fibre are important factors. Environmental factors such as climate, rainfall, soil, fertilizers and length of daylight period must be considered in choosing varieties.

B. A. 19, 1549 (1945).

(1617) Woodroof, J. G. Preserving Fruits by Freezing. I. Peaches Ga. Agri. Expt. Sta. Bull. 163, 1930. pp. 3-46. - Experimental and commercial methods of freezing peaches are described. When peach tissue is heated to 60-70° C., more darkening occurs than at higher or lower temperatures. The temperature of the lye bath is more important in discoloration than the concentration of the lye. Optimum conditions for lye-peeling peaches are: Immerse for 2 minutes in 10% lye (NaOH) solution at a temperature of 60° C., wash in running water and pass through a 2% citric acid solution to neutralize the excess of alkali and to retard browning. Peach tissue freezes at 2.06° C. and has an osmotic pressure and freezing point lowering similar to those of 30% sucrose solution. A 30-35% sucrose sirup added at the rate of one part sirup to 3 parts of peach, produces the least change in frozen or thawed peach tissue. Peaches frozen in glass containers oxidized more rapidly than those in paper or Sn containers because of the presence of air plus light. Vacuum packing greatly reduced oxidation and discoloration of the fruit. Of the substances used to prevent discoloration, 2% citric acid, 2% NaCl, 4% H_3PO_3, 2% H_2SO_3 gave the most promising results. When air comes in contact with peach tissue, O_2 is activated through the agency of peroxidase, probably by the formation of an organic peroxide, and this in turn oxidizes the chromogen, a substance of tannoid nature; the latter upon oxidation, gives rise to the brown pigment.

C. A. 25, 1293 (1931).

(1618) Woodroof, J. G. and Bailey, J. E. Preserving Fruits by Freezing. II. Figs. Ga. Agri. Expt. Sta. Bull. 164, 1930. pp. 3-11. - Color, taste and texture are not affected by exposing peeled figs to the air for an hour or more. As in freezing peaches, a 35% sugar sirup gave the best results. Fresh figs contain H_2O 70-80%, sugar 10-20%, acid .05-0.1%, ash 0.4-0.5% and other organic matter 11-20%. Figs cannot be peeled by the use of lye. A very low temperature destroys the red pigment in the seed cavity. More satisfactory results were obtained at 18° C., or even higher, than at lower temperatures. Fresh figs freeze at about -3.3° C.; when packed in a 35% sugar sirup the freezing point is lowered to -4.4° C., and the mass remains in a solid frozen condition at -7.2° C.

C. A. 25, 1293 (1931).

(1619) Woodroof, J. G. Preserving Fruit by Freezing. Georgia Agriculture Experiment Station, Press Bulletin 310, 1930.

(1620) Woodroof, J. G. Fruit Freezing Conference. Georgia Agriculture Experiment Station, Circular 89, 1930.

(1621) Woodroof, J. G., "Peeling Peaches for Freezing." Fruit Prod. J. 9, 375 & 377 (1930). - Peeling peaches by hand is unsanitary and too expensive and slow so for commercial use or home canning peaches have peeled by immersion in boiling lye solution. This is not satisfactory for frozen peach preparation as the product darkens and there is an outer cooked layer. Following formula proved successful "10% solution of sodium hydroxide or 'lye' held at a temperature of 140° F., peaches completely emersed for 2 minutes in lye solution, than vigorously sprayed with clean water, treated for 1 minute with 3% citric acid solution to remove excess lye and retard darkening of the surface, remove pits, slice and freeze as quickly as possible."

F. F.

(1622) Woodroof, J. G. Preservation Freezing. Some Effects on Quality of Fruits and Vegetables. Georgia Agriculture Experiment Station Bulletin 168, 1931. pp. 3-23. - The loss of plant juices in freezing is due not to rupture of cell walls but to irreversible precipitation of cell contents, liberating bound water and water which was previously within vacuoles, and was not later reabsorbed. Ice crystals do not break down the cell walls but do destroy the cell contents causing collapse of structure regardless of the temperature used in freezing. Starch grains and such starchy foods as peas and shell beans are not greatly changed in appearance by freezing. Covering fruit before freezing with an isotonic Aq. solution of sucrose decreased the destructive effect of freezing on structure and desiccation. Storage at -18° is preferable to higher temperatures for frozen foods. Freezing fruits and vegetables for use as food is strongly recommended.

C. A. 26, 4386 (1932).

(1623) Woodroof, J. G., Fruit-Freezing Tests. Georgia Agriculture Experiment Station, Annual Report, 1931. pp. 36-7. - Peaches, blueberries, avocados, figs, Labrusca grapes, raspberries and Japanese persimmons when frozen lose all, or practically all, of their characteristic aroma; cantaloupes, grapefruit pulp, muscadine grape pulp, cherries and strawberries retain nearly all of their aroma. In general the flavor and color of fruits are well retained by freezing preservation. Each product has a definite optimum temperature at which it should be frozen and stored. An initial freezing temperature below -10° destroys the red pigment in figs. Peaches are preferably frozen and stored at or below -10° to minimize color and flavor changes.

C. A. 27, 786 (1933).

(1624) Woodroof, J. G., "Some Effects of Preservation by Freezing on Quality of Fruits and Vegetables." Proc. Am. Soc. Hort. Sci. 28, 507-8 (1931). - Freezing of fruits and vegetables has either destructive or preservative powers depending upon conditions of freezing and subsequent thawing. Evidence shows that each product has an optimal temperature for freezing and for thawing. To obtain best results and preserve fresh-like quality, fruits should be eaten just before thawing is complete, or immediately

thereafter. There is a great loss of water during thawing which accounts for flabbiness and other changes similar to those occurring during cooking and other treatments. Using the loss of fluids as a "measure of the destructive effects of the various treatments, one might list in order from least to most destructive, the following: alcohol, salt, quick freezing, sugaring, slow freezing, cooking, drying."

F. F.

(1625) Woodroof, J. G., "Frozen Foods in Relation to Ice Manufacturing." Ice & Refrig. 80, No. 4, 360 (1931). - Standardization of frozen food products; roles that ice manufacturers can play in production and handling of frozen foods; tests made in shipping. Before Ga. Ice Mfrs. Assn.

E. I. 1931, 594.

(1626) Woodroof, J. G., "What Can Be Frozen." Refrig. 49, No. 1, 50-51, 54 (1931). - Test results show that 79 varieties of 25 fruits and vegetables quick frozen at Georgia Experiment Station; preservative solution; experiments with containers.

E. I. 1931, 1206.

(1627) Woodroof, J. G., "Preservation of Fruits and Vegetables by Freezing as an Industry." Fruit Prod. J. 11, 138-43 (1932). - Studies on effects of freezing on the structure of tissue - methods given: (1) After complete defrosting tissue of peach, apple, pear, plum, avocado, strawberry, blackberry, raspberry, tomato, celery, lettuce, rhubarb, watermelon, cantaloupe and asparagus was flabby and water loss great. The rate of loss was rapid at frist gradually decreasing. (2) Loss of juice not due to rupture but to "the irreversible precipitation of cell contents." (3) Flabbiness due to breaking down of contents of support cells. (4) Loss of water thru leakage same as ordinary loss in cooking, or with high salt or sugar concentrations, or in dessication. (5) Freezing, cooking, brining, sugaring and drying each bring about irreversible precipitations in which water in the vacuoles is set free and tissue becomes flabby. (6) Differences in freezing temperature brought about slightly different effects on the cell contents. These were differences in kind not in general type - for all temperatures used caused breakdown in cell content. (7) Shelled beans and peas showed only slight change because of starch grains present in cell walls. Change which did occur was alteration of protein fraction of protoplasm. (8) Tissues with very thick cell walls did not become flabby. Also thawing temperatures were studied and best product was obtained when defrosted for 12 or more hours at from 32 to 40° F.

F. F.

(1628) Woodroof, J. G. Chemical Studies of Frozen Fruits. Georgia Agriculture Experiment Station, Annual Report, 1932. - Cf. Abstracts No. 1622 and 1623. The acidity of the expressed juices of fruits increases on freezing. Condition determinations on salt and sugar solutions in which peaches and strawberries were immersed for varying periods indicated that 35% sugar solutions were most suitable for peaches and 60% for strawberries. Various concentrations of CO_2, N and air showed no beneficial effects on the keeping quality of peaches at 4-5°. Respiration studies showed that the gases in fresh fruits were not appreciably expelled by freezing but were slowly lost while the fruit was in the frozen state. Vacuum packing of fruit in sugar sirup caused greater penetration of the sirup into the tissue. C. A. 28, 226 (1934).

(1629) Woodroof, J. G., "Experiments in Food Freezing." Refrig. Eng. 23, No. 6, 8, 70, 82, 366 (1932). – Influence of freezing on quality of fruits and vegetables; chemical and physical biological activities; summary of micro-physical changes in plant cells on freezing.

E. I. 1932, 1111.

(1630) Woodroof, J. G. Microscopic Studies of Frozen Fruits and Vegetables. Georgia Agriculture Experiment Station Bulletin No. 201, 1938. – Description of experimental methods: methods of freezing, methods of testing (color, leakage, pressure), methods of preparing microscopic sections and staining. Presentation and discussion of results: kinds of products studied, shapes and sizes of ice crystals, position and location of ice crystals, temperature and rate of freezing, leakage measurements, pressure tests for firmness, study of colors, storage temperatures. Summary: the smaller the crystal masses the less the destruction, with minimum destruction being reached when ice crystals were contained within individual plant cells. The faster the rate of freezing the smaller the crystals formed, with the variation being as great as 500 times when the freezing rate is varied. Results indicate that immersion freezing at 0° F. of small particles is satisfactory if the solution is agitated, and that storage at from 0 to 5° F. is necessary. Literature cited.

F. F.

(1631) Woodroof, J. G., "Ice Crystals in Frozen Fruits." Ice & Cold Storage 42, No. 498, 139–40 (1939). – The solidity, rigidity or firmness of tissues usually frozen appears to be due to the distribution and state of the liquid in the cell, possibly in the form of surface films between granules, microsomes or droplets of various kinds as well as to the presence of vascular bundles, thickened walls or cuticle. The removal of a part of this water by freezing at moderately low temperatures and later restoring on thawing is partly reversible and to that extent is not injurious; while the complete removal at a very low temperature seems to precipitate the colloids and is irreversable. However, the cell walls of some fruits and vegetables are easily broken by ice crystals on freezing. Cell-wall rupture is much more frequent in some tissues than in others and is associated with the nature of the material frozen, the time and the rate of freezing and the size, shape and location of the ice crystals. The cells of rhubarb are much more inclined to push apart than cells of other plants of this group. The cells of string-bean pods sometimes separate rather than rupture, but those of spinach, asparagus and broccoli rupture badly. Ripe strawberries, raspberries, dewberries, peaches, figs and cherries are difficult to freeze because of the ease with which their collodial complex is changed. A short interval between formation of the first ice crystals and the complete hardening of the product is essential for the preservation of texture, palatability and satisfactory superficial appearance of fruits and vegetables.

C. A. 34, 1089 (1940).

(1632) Woodroof, J. G., "Comparing Methods of Freezing Fruits and Vegetables." Refrig. Eng. 37, No. 1, 9–12 (1939). – Intensive study of methods of freezing, by examining quality of product produced, included samples of all commercial packs of fruits and vegetables available in South, as well as large number of packs not prepared in commercial quantities; tables showing effect of different freezing methods on various fruits and vegetables. Before Food Preservation Conference, Univ. Tenn. Cf. Food Industries 10, 618–21 (1938), "Freezing Methods Evaluated."

E. I. 1939, 1005.

(1633) Woodroof, J. G., "Freezing by Immersion." Refrig. Eng. 37, No. 6, 384-7 (1939). - Progress report on studies of microphysical changes occurring in fruits and vegetables during and subsequent to freezing for preservation; agitation affects rate of freezing; requirements for medium for immersion. Before Am. Soc. Refrig. Engrs. (entitled, "Media for the Immersion Method of Freezing.").

E. I. 1939, 1005.

(1634) Woodroof, J. G., "Method for Fixing 'Ice Crystal Patterns' in Frozen Products." Science 89, 87 (1939). - Method is given for making frozen microtome sections of fruits and vegetables preserved by freezing. Staining technics are also discussed. Through these procedures ice crystal patterns could be fixed, measured, and accurately photographed. This provides a means of evaluating methods of freezing.

F. F.

(1635) Woodroof, J. G., "Preventing Browning of Peaches During Freezing and Storage." Can. Dairy and Ice Cream J. 19, No. 7, 54 (1940). - Cf. Abstract No. 1636. Soft ripe peaches can be frozen and stored without objectionable browning if they are handled speedily after cutting and treated with such antibrowning agents as acids, thiourea and sirups. Citric acid or HCl can be used to treat peaches for preventing browning. Internal browning is poorly controlled by chemical antibrowning agents owing to lack of penetration but is controlled by a heavy sugar glaze about each individual slice of peach.

C. A. 35, 2234 (1941).

(1636) Woodroof, J. G., "How to Prevent the Browning of Peaches in the Freezing Industry I." Food Ind. 12, No. 5, 35-7 (1940). - The J. H. Hale is relatively non-browning and is one of the best varieties for freezing. If peach slices are kept wet with a solution at pH 3.47, or slightly lower, browning is well controlled. HCl was used to acidify the water and Na phthalate and phosphate buffers were employed as buffering agents. Changes in pH and total sugars in peaches, due to the freezing process, are very slight and do not account for any increased browning of frozen peaches over fresh peaches. Literature is reviewed.

C. A. 34, 4478 (1940).

(1637) Woodroof, J. G. Foods Suitable for Freezing Preservation. Freezing Locker Plants. Ga. Expt. Sta. Bulletin No. 212, 1941. 34 pages. - Fruits, vegetables, juices, meats & dairy products which are suitable and unsuitable for freezing: tables giving name, suitability, treatment before freezing, form in which frozen, suitable varieties, minimum and maximum loss in weight, season, uses of frozen products. Freezing locker storage plants: services, location, plant layout, food preparation room, meat aging room, freezing locker room, management of plant. Storing and serving frozen foods. Bibliography.

B. A. 17, 197 (1943).

(1638) Woodroof, J. G. and Tankersly, J. O., "Factors That Affect Quality in Frozen Lima Beans." Food Industries 13, No. 4, 53-6 (1941). - Either blanching, freezing or cooking in an alkaline medium intensifies color, accentuates flavor, and aroma, and reduces time of cooking, but likewise destroys vitamin C. Copper in solution also intensifies color but de-

stroys vitamin C. NaCl slightly improves color and palatability. Salts of aluminum, zinc, and iron are detrimental to desired colors. Freezing reduces the time of cooking Lima beans about 10%. Shelling, grading, blanching, and freezing should follow in succession as rapidly as possible in order to have maximum color, flavor and nutritive value. Freezing should be completed within 6 hours after harvesting.

C. A. 36, 3572 (1942).

(1639) Woodroof, J. G., "The Desiccation of Frozen Foods in Freezer Locker Stores." Fruit Prod. Journal 20, No. 10, 306-309, 321 (1941); Quick Frozen Foods 3, No. 11, 12-14, 36-37. - Frozen foods stored in individual lockers are much more subject to desiccation than larger scale frozen food products. One of the most important factors in the prevention of this undesirable loss in weight is poor packaging. Desiccation of a frozen food product may also take place in a sealed container, where there is a fluctuating temperature. On a rising temperature moisture passes from the food into the air within the container (unless it is completely filled and evacuated) and on a falling temperature the moisture is deposited on the inner surface of the container as frost. In this way, with each rise and fall in temperature more moisture leaves the product to be refrozen elsewhere. The flavors and odors pass from the product at the same time and are deposited on the surface of the container or on the cooling coils with the frost. Some loss in flavor also occurs through respiration which is stimulated by ice formation within the tissues. Case-hardening and other irreversible physical changes may also take place on the surface. Tinfoil, latex, or heavily parafinned containers were the best preventors of desiccation. Even though desiccated products may absorb nearly all the water which they had lost, upon soaking their flavor cannot be regained. Sugar added to frozen fruits greatly retards desiccation; invert sugar is the most effective for this purpose. Freezing by syrup immersion in about 58% invert sugar syrup is the most effective. This syrup is reduced to about half its original strength by the time equilibrium is reached with the juices of the product. B. A. 16, 699 (1942).

(1640) Woodroof, J. G. and Tankersly, J. O., "Freezing Fruits and Vegetables by Immersion." Ice & Refrig. 100, No. 4, 309-310 (1941). - Brief history of immersion freezing is presented; note on similarity between freezing and cooling by immersion; present status of method. Bibliography.

E. I. 1941, 1026.

(1641) Woodroof, J. G., "Desiccation of Food Products Stored at Low Temperatures." Refrig. Eng. 42, No. 6, 383-7 (1941). - Report on fundamental study of dehydration at low temperatures; discussion of effects of various methods of freezing on desiccation and data on dehydration of different products; glazing and case hardening are considered as means of protection against desiccation. Before Univ. of Tenn. Food Conference.

E. I. 1941, 260.

(1642) Woodroof, J. C., "Eliminating Off Tastes and Odors in Frozen Foods." Quick Frozen Foods 5, No. 12, 16, 30 (1943). - Selection of prime fresh material, proper packaging and maintenance of a constant storage temperature at 0° F. or lower prevent off-flavors and odors. Flavors are often improved by the addition of sugar, salt, or small amounts of citric acid. The frozen food processor should keep himself informed of research developments. B. A. 18, 907 (1944).

(1643) Woodroof, J. G. and Dupree, W., "Frozen Food Containers and Container Materials." Refrig. Eng. 45, 75-81, 117 (1943). - Data on more than 5200 weighings of five frozen food products placed in packages of approximately 100 kinds and combinations of packaging materials over period of 1 year; authors stress importance of use of paraffin, and point out that every package must have water impervious film, and that one is enough. Bibliography.

E. I. 1943, 425.

(1644) Woodroof, T. G. and Atkinson, I. S. Preserving Sweet Potatoes by Freezing. Ga. Exp. Sta. Bull. No. 232, 1944. 26 pages. - Sweet potatoes made an excellent and economical frozen product when washed, peeled, heated under 10 lb. steam pressure to an internal temperature of 190° F., pureed, and packed with 0.2% citric acid either prevented or corrected discoloration which was due to oxidation and enzyme action. Contact with iron caused the potatoes to turn black. After examination of 19 lots of frozen sweet potatoes which were prepared differently, this treatment was found to most nearly preserve the natural flavor, color, and aroma. This makes available for year round consumption a product which may be very satisfactorily substituted for the fresh potatoes that are on the market for only about half the year.

B. A. 19, 159-60 (1945).

(1645) Woodroof, J. G. Preserving Foods by Freezing. Ga. Exp. Sta. Bull. No. 233, 1944. 42 pages. - This is a summary of experiments in preserving foods by freezing, covering 15 years. Frozen foods have been increasing in popularity for 16 years through freezer locker plants, home freezers and in commercial freezing plants. Each outlet requires different equipment, and each serves a different clientele. The frontier of knowledge on frozen foods is being constantly extended until now it includes all fruits in some form, most vegetables, meats, fish, eggs, juices, puree, and many cooked foods. Precooked puree of pumpkins and sweet potatoes are recent additions. For serving meats, eggs and vegetables should be thawed before attempting to cook them; while most fruits for desserts should be served just before thawing is complete.

B. A. 19, 133 (1945).

(1646) Woodroof, J. G. and Atkinson, I. S., "Freezing Provides Answer to Sweet Potato Problem." Food Ind. 16, No.'s 7, 535-7, No. 8, 629-31, No. 9, 714-5 (1944). - Experiments indicate that freezing will preserve sweet potatoes in high quality condition for year round consumption; steps in grading, peeling and trimming that precede freezing outlined; problems of discoloration; methods of cooling, pulping, packing and storing; outline of various uses to be made of frozen sweet potatoes, particular as ingredient. Cf. "Preparation of Sweet Potatoes for Freezing." Locker Operator 5, No. 9, 14, 31 (1944).

E. I. 1944, 889.

(1647) Woodroof, J. G. and Atkinson, I. S., "Blueberries for Freezing Improved by Blanching." Refrig. Eng. 48, No. 4, 275-8, 314 (1944). - Report on tests conducted at Georgia Agricultural Experiment Station; it was found that steam blanching blueberries for one minute prior to freezing not only prevented formation of woody texture, but improved flavor, aroma, and palatability of berries. Bibliography. Paper No. 131, J Series, Ga. Agric. Experiment Station. E. I. 1944, 890.

(1648) Woodroof, J. G. and Atkinson, I. S. Freezing Preservation of Cooked Foods. Ga. Exp. Sta. Bull. No. 242, 1945. 15 pages. - When properly prepared, packaged, and stored a wide variety of cooked foods may be frozen. It is more difficult to hold volatile flavors in this type product than in raw frozen foods.

F. F.

(1649) Woodroof, J. G. and Atkinson, I. S., "Freezing Cooked Foods: Parts I & II." Food Indust. 17, No. 9, 1041-2, No. 10, 1178-9 (1945); Canner 101, No. 20, 24, 26, Part I; No. 21, 30, 32, 34, 42, Part II. - I. Varieties of cooked fruits and vegetables, meats and some combination dishes which can be frozen satisfactorily—their preparation and packaging. II. Continuation of types of cooked foods that can be frozen—discussion of additional combination dishes, bakery products and other foods—their preparation and packaging.

F. F.

(1650) Woodroof, J. G. and Atkinson, I. S., "Freezing Muscadine Grapes." Food Packer 26, No. 12, 48 (1945). - Process described for freezing muscadine grapes. Previously they were considered unsuitable for freezing, because of the seed, tough skin, and bitterness in the hulls.

B. J. W.

(1651) Woodroof and Klaas. A Study of Soybean Varieties, with Reference to Their Use for Food. Illinois Agriculture Experiment Station Bulletin No. 443, 1938.

(1652) Woodruff, S., "Food Preparation and Utilization Aspects of Refrigerated Locker Storages." Agric. Eng. 20, No. 3, 105-7 (1939). - Discusses problems of food preparation and freezing from standpoint of the home. Some results of study at University of Illinois on locker freezing of vegetables and fruits are mentioned.

W. B. C.

(1653) Woolrich, W. R., "Some Physical and Chemical Properties of Foodstuffs." Ice & Refrig. 79, 493-4 (1930). - Freezing points of foodstuffs; water content of fruits and vegetables; latent heats, effects of quick freeze industry; table of computed latent heats of vegetables based on tabulated water percentages; before Nat'l Assoc. Practical Refrig. Engrs.

E. I. 1930, 1500.

(1654) Woolrich, W. R., "Progress in Refrigeration During 1930." Power Plant Eng. 35, No. 8, 207-9 (1931). - Developments in refrigeration; outstanding features of progress in refrigeration-plant equipment; carbon dioxide refrigeration; refrigeration and frozen food development; air conditioning and cooling.

E. I. 1931, 1202.

(1655) Woolrich, W. R., "Latent Heats of Foodstuffs." Refrigerating Eng. 22, 21-4 (1931). - The heat of fusion of fresh vegetables, fruits, meats, and dairy products appears to be directly proportional to the moisture content. The presence of salts, starches, sugars, and fats in varying a-

mounts in the substance being frozen has no measurable effect on the heat of fusion. Their total heat, above any designated temperature, is affected only in that their lower freezing point gives a wider temperature range involving the specific heat above freezing value, and a narrower range involving a specific heat below freezing.

C. A. 25, 4319 (1931).

(1656) Woolrich, W. R., "Refrigerating Engineer Should Know Units of Refrigeration." South Power J. 50, No. 6, 33-4 (1932). - Units of refrigeration; latent heat of evaporation; sublimation; relation between heat and work. Aug.: Cold Storage and quick freezing; tables showing computed latent heats of vegetables, fruits and average freezing points of fruits and vegetables. Cf. South Power J. 50, No. 8, 14-16 (1932).

E. I. 1932, 1107.

(1657) Woolrich, W. R. The Latent Heat of Foodstuffs. U. Tenn. Eng. Exp. Sta. Bull. No. 11, 1933. - Direct relationship between latent heat of fusion of foodstuffs and moisture content--with knowledge of one, the other may be determined by mathematical calculations. The presence of alcohol lowers the fusion point "by virtue of the breakdown of the starches or sugars". The presence of fats, starches, sugars, and mineral salts has no measurable effect on the value of the latent heat of fusion of foodstuffs.

F. F.

(1658) Woolrich, W. R., "Refrigeration and Readjustment in Tennessee Valley." Refrig. Eng. 29, No. 1, 13-5 (1935). - Role of refrigeration in modern agriculture, with special reference to Tennessee Valley development; refrigeration and decentralization.

E. I. 1935, 11.

(1659) Woolrich, W. R., Handbook of Refrigerating Engineering. New York: D. Van Nostrand Co., 1938. - Information concerning all phases of refrigeration for use of those desiring to take up or now engaged in that work; covers fundamental definitions and thermodynamic principles, refrigerants, systems and equipment, air cooling and conditioning, preservation of foodstuffs, and special units.

E. I. 1938, 1020.

(1660) Woolrich, W. R., "Future of Refrigeration in the South." Ice & Refrig. 97, No. 1, 16-8 (1939). - Resources; changes in country; refrigeration facilities essential for South; transportation of frozen foods.

E. B.

(1661) Woolrich, W. R., "Quick Freezing, Its Economic Development and Most Recent Discoveries." La. Eng. Soc. Proc. 26, No. 3, 140-53 (1940). - Discussion of advantages of quick-freezing of food products; methods of quick freezing; historical development in southern states; economic factors; expansion possibilities of locker storage in southern states.

E. I. 1940, 1023.

(1662) Woolrich, W. R., "Locker Storage and Related Freezing Facilities for Community Storage Plants." Ice & Refrig. 100, No. 3, 199-202 (1941). -

History of growth of locker plants; contributing factors to recent rise of locker storage popularity; present status of food freezing in locker plants; types of locker plants; locker room temperature; estimating table for locker plants; future of locker freezing plants.

E. I. 1941, 262.

(1663)Woolrich, W. R. and Bartlett, L. H., "Quick and Flash Freezing of Foods." Mech. Eng. 64, No. 9, 647-53 (1942). - Theories on cause of food damage by slow freezing; rapid freezing rates not essential to all foodstuffs; variations in freezing ranges of foods to be frozen; supercooling phenomena in freezing colloidal foods; existing commercially used quick freezing processes and freezing equipment; New University of Texas polyphase freezing process; polyphase freezing machine. Bibliography. Before Am. Soc. Mech. Engrs.

E. I. 1942, 922.

(1664) Woolrich, W. R. and Bartlett, L. H., "Plant for Quick-Freezing of Foodstuffs." Mech. World 112, No. 2921, 599-601 (1942); Modern Refrig. 45, No. 537, 221-2 (1942). - Before Am. Soc. Mech. Engrs., indexed in Engineering Index 1942, p. 922, from Mech. Eng., Sept., 1942.

E. I. 1943, 896.

(1665) Woolridge, W. R., "Meat Preservation." Vet. Record 13, No. 44, 1112-26 (1933). - An address summarizing present knowledge, with full discussion—presented at the 51st Annual Congress of the National Veterinary Medical Association of Great Britain and Ireland, Llandudno, Sept., 1933.

B. A. 8, 1747 (1934).

1666) Wright, A. M., "Methods of Chemical Control in the New Zealand Meat reezing Works." J. Soc. Chem. Ind. 28, 124-5. - An outline of determinaions made and methods used; qualitative, to ascertain if certain impuriies are absent or whether the color, odor, and taste of the finished product meets the requirements; quantitatively to determine if the products ave been economically manufactured and to make sure that the finished roducts conform to the guarantee to the purchaser. Determinations are ade as follows: in tankage, moisture, phosphate, N and fat; in dried lood moisture and N; in tallow, titer, moisture, dirt, animal tissues and ree fatty acids; in wool, moisture, natural wool grease, other fats, sand irt and lime, wool fiber; in meat extract, moisture, ash, fat, substances recipitated by 80% and substances soluble in 80% alcohol, taste and color. n preserved meats, preservatives (mainly B_2O_3) and ptomaines; in oleomararine, color, rancidity; in glue, ash, moisture, gelatin, non-nitrogenous atter, N, and water absorbed; also chemicals used in various processes in actory are examined, lubricating oils and special problems that arise. everal tables showing typical analyses and average results are given.

C. A. 3, 1315 (1909).

1667) Wright, A. M., "Chemistry in Relation to the Frozen Meat Industry f New Zealand." J. Ind. Chem. 5, 673-4. - A brief description of the ethods of utilizing by-products of the frozen meat industry and of the ystem of chemical control.

C. A. 7, 3622 (1913).

(1668) Wright, A. M., "Some Applications of Chemistry to the Frozen Meat Industry." Cold Storage & Ice Assoc. Proc. 15, 31-51 (1918-19). - Account of investigation on effect of cold storage on meats conducted in chemical laboratory of New Zealand Refrigerating Co., Ltd.

E. I. 1920, 148.

(1669) Wright, A. M., "The Method and Scope of Scientific and Industrial Research With Special Reference to the Frozen Meat Industry." Cold Storage & Ice Assoc. Proc. 15, 147-159 (1918-19).

(1670) Wright, A. M., "Chemical Technology of the Frozen Meat Industry." New Zealand J. Sci. Tech. 4, 74-83 (1921). - A review, chiefly of the principles involved in conducting the manufacturing processes of the meat industry, considering slaughter tests, frozen meats, changes and mold growth occurring during cold storage, meat canning and extracts and edible fats.

C. A. 15, 3343 (1921).

(1671) Wright, A. M., "Chemical Technology of the Frozen Meat Industry." New Zealand J. Sci. Tech. 4, 97-107, 155-64 (1921). - A continuation of Ibid. 4, 74 (1921), dealing with tallow, tankage, concentrated tankage, dried blood, bone dust, hoofs and horns, compound fertilizers and casings. III - This concluding article deals with wool, pelts, hides, H_2O supply, sewage and chemical control. The series cites 57 references.

C. A. 16, 597 (1922).

(1672) Wright, A. M., "Presence of Vitamin B in Frozen Flesh Food." Soc. Chem. Ind. Jour. 42, 403-404T (1923). - The paper is a record of an investigation carried out in order to determine the effects of up to nine years' cold storage upon the vitamin B present in beef, mutton, lamb, and pork, the temperatures during cold storage ranging from 2° to 15° F. (-17° to -9° C.). From the results of the experiments it is found that cold storage up to nine years at temperatures ranging from 2° to 15° F. does not destroy, nor, as far as can be determined, does it effect the vitamin B of meats.

E. M. F.

(1673) Wright, A. M., "Molds on Frozen Meats." J. Soc. Chem. Ind. 42, 488-90T (1923). - Defective refrigeration or careless handling of stored meat may allow the temperature to rise to -2° to 4°, enabling various common molds to develop. When the temperature of the meat is again lowered "black spot" is produced where molds have developed. Meat carefully kept at temperatures below -9° can be stored for years without the production of black spot.

C. A. 18, 719 (1924).

(1674) Wright, A. M., "Presence of Vitamin A in Frozen Pork." Soc. Chem. Ind. Jour. 42, 509T (1923). - In this paper is a description of the experiments of the author in which pork was fed to the experimental animals in a raw state, mixed with other dietary constituents and the weight of the animals was recorded each week. The results clearly show that even after nine years' cold storage at 2° - 15° F., vitamin A remains active.

E. M. F.

(1675) Wright, A. M., "Chemical Technology of the Frozen Meat Industry." New Zealand J. Sci. & Technol. 9, No. 2, 72-90 (1927).

(1676) Wright, R. C. Some Effects of Freezing on Onions. U. S. Dept. Agric., Circ. 415, 1927. 8 pages. - Some of the factors relating to the freezing of onions include the previous storage temperature, undercooling, resistance to freezing, and storage conditions.

B. A. 2, 466 (1928).

(1677) Wright, R. C. and Magruder, R., "Promising New Varieties of Lima Beans for Freezing." Food Ind. 10, 399 (1938). - Digest from private communication from Wright & Magruder. Gives new varieties of Lima beans suitable for freezing: U. S. #2, Maryland Thick Seeded, and Baby Fordhook; Illinois Baby Potato, is not as good as the others for its late crops would show variation in size.

F. F.

(1678) Wright, R. C., "Low Temperature Effects on Physiology of Plant Organs in Relation to Commercial Storage." Ice & Refrig. 97, No. 4, 261-4 (1939). - Consideration of effects of low temperature on plants narrowed to discussion of these effects on fruits and vegetables in commercial storage; effects on physical structure; effect upon apples; responses of potatoes; effects on chemical composition; susceptibility to decay and on subsequent life after removal from storage. Before Am. Soc. Plant Physiologists.

E. I. 1939, 259.

(1679) Wright, R. C. The Freezing Temperatures of Some Fruits, Vegetables, and Florists' Stocks. U. S. Dept. Agric. Circ. 447, 1942. 12 pages. - Data are given on average maximum and minimum freezing temperatures for many varieties of apples, blackberries, cherries, cranberries, dates, grapes, oranges, peaches, pears, plums, raspberries, strawberries, and many other minor fruits (coconuts, figs, gooseberries, mango, avocado, papaya), nuts, most commercial vegetables, and cut flowers and bulbs of many species. Freezing or freezing injury does not always occur when fruit or vegetable products are exposed to temperatures at or below their actual freezing points. Under certain conditions many of these products can be undercooled; that is, cooled to a point below the true freezing temperature of each and again warmed up without freezing and without apparent injury. Certain products under certain conditions may be actually frozen and afterwards thawed out without apparent injury, but some products are injured by chilling if stored at temperatures well above their actual freezing points. Different individuals of the same variety and strain when grown under different conditions may have somewhat different freezing points, and there are also some variations in the freezing points of products of the same variety and from the same lot. Sometimes this is due to different degrees of maturity.

B. A. 16, 728 (1942).
B. A. 12, 979 (1938).

(1680) Wynne. Frozen Food Lockers. New York University Occupational Abstract No. 86, 1945.

(1681) Yaroshenko, V. N. and Zverevo, T.A., "Vitamin C in Fresh and Frozen Vegetables." Konservnaya I Plodoovoshcnaya Prom 1, 19-21 (1940); Khim. Referat. Zhur 8, 43 (1940). - The contents of vitamin C in Spinach, cauliflower, string beans, and peas were determined according to Tillmans-Bukin. The losses of vitamin C did not exceed 6 - 19% on washing the vegetables with steam and cooling them with air. The losses reached 24 - 43% on cooling them with water. The losses of vitamin C were 1 - 28% on keeping the vegetables in the frozen state. Vegetables frozen and covered with a 2% salt solution lost very little of their vitamin C content. The losses were 14.9 - 20.5% after defrosting and 7 - 33.1% after boiling the defrosted vegetables. Frozen vegetables kept for several months preserved the appearance, taste and consistency of fresh vegetables and contained large amounts of vitamin C.

C. A. 36, 6257 (1942).

(1682) Young, E. J. and McIntosh, J. A., "Effect of Locker Storage on Quality of Pork." Refrig. Eng. 45, No. 2, 100-3 (1943). - Report on study of effect of locker storage on pork chops, roasts and sausage; chemical, mechanical and organoleptic measurements were made.

E. I. 1943, 233.

(1683) Young, O. C., "Freezing Curves for Fish." Ice & Cold Storage 39, No. 458, 106-7 (1936). - Further investigations in cooling rates of fish cooled by different methods carried out in labs of Pac. Exp. Sta., Prince Rupert, B. C.; cooling curves for salmon and halibut; test methods; eutectic brine; sharp freezing.

E. I. 1936, 953.

(1684) Young, O. C. Experiments on the Preparation of Shrimps for Freezing. Pacific Biology Station and Pacific Fisheries Experimental Station, Biology Board of Canada Progress Reports 43, 1940. pp. 3-5.

(1685) Young, O. C., "Further Tasting Pavel Tests on Frozen and Stored Fish." Food Indust. 12, No. 4, 95 (1940). - Digest of article in Progress Report No. 42 of Pacific Biological Station and Pacific Fisheries Exp. Station, p. 16, 1939. Tests indicate that freezing rate and storage temperatures both affect taste. Best results are obtained when quick freezing and low storage temperatures are combined. Salt uptake is increased by freezing, but upon thawing salt is given up more readily, thereby rendering a milder product. The amount of uptake varies with different species of fish and is probably related to oil content of fish muscle.

F. F.

(1686) Young, O. C., "Food Freezing Methods." Modern Refrig. 43, No. 512, 225, 228 (1940). - Notes on advancements in methods of applying refrigerating effect for purpose of accelerating heat exchange during freezing processes, and to improvements in arrangements of food freezing and handling facilities; major limiting factors in freezer design.

E. I. 1940, 1022.

(1687) Young, O. C. Thawing of Fish, I and II. Pacific Biology Station and Pacific Fisheries Experimental Station, Biology Board of Canada Progress Reports 47, pp. 1-5; 150, pp. 16-20, 1941.

(1688) Young, O. C., "Reduces Drying in Air Blast Freezing." Food Indust. 13, 92-3 (1941). - Digest from "Freezer Studies" by O. C. Young. Progress Reports of Pacific Biological Station and Pacific Fisheries Exp. Station. No. 45, 1940. Page 7. Method presented for reducing drying in sharp freezing - this is of great importance for drying is a major factor which limits freezer designs in fish industry.

F. F.

(1689) Zarotschenzeff, M. T., "Rapid Freezing and Chilling of Fish and Meats in Atomized Brine." Ice & Refrig. 77, No. 3, 155-6 (1929). - New method of rapid freezing and chilling of meats and fish is developed by M. T. Zarotschenzeff; four fields of application; investigations by expert refrigerating engineers; present installation in operation in Europe. Cf. Mech. Eng. 51, No. 12, 953-4 (1929).

E. I. 1929, 1574.

(1690) Zarotschenzeff, M. T., "Quick Chilling of Pork for Bacon." Zeit fuer Eiz und Kaelte Industrie 21, No. 3, 25-31 (1928). - Discusses quick vs slow freezing of meat; experimental study of refrigeration of pork and liver with atomized cold water and with atomized brine.

E. I. 1928, 1581.

(1691) Zarotschenzeff, M. T., Between Two Oceans. The Cold Storage and Producer's Review, London, England, 1930.

(1692) Zarotschenzeff, M. T., "Progress in Rapid Freezing and Chilling Practice." Cold Storage 33, No. 393, 365-66 (1930). - Summary of acheivments during the last five years; progress during 1930; application of quick-freezing in Europe; problems connected with freezing and shipping of food products. Before Brit. Assn. Refrig.

E. I. 1930, 1500.

(1693) Zarotscheneff, M. T., "Rapid Chilling and Freezing of Fish and Meat in Atomized Brine." Ice & Cold Storage 33, No. 389, 198, 199-200; No. 390, 225,227; No. 391, 260-61; No. 392, 291-93 (1930). - Aug: Early experiments and rapid freezing in state of anabiosis is explained; temperature of organisms; Bachmetieff's electric thermometer; fish freezing in air. Sept: Value of continuous process is emphasized and use of atomized brine explained; experiments in chilling and freezing; Revel experiments in 1926-7; indirect methods of freezing; tests on direct contact freezing. Oct: Results of further experiments together with trials of installations fitted on board trawlers. Scheme of "Z" installation in Paris "Vaugirard" cold stores; fish freezing in Italy. Nov: Results obtained with experimental plant; temperature during storage; influence of oxygen.

E. I. 1930, 1500.

(1694) Zarotschenoff, M. T., "Rapid Freezing with Atomized Brine." Ice & Refrig. 79, 389-90, Nov; 513-14, Dec. (1930). - Nov: Results of years of investigating and experimenting on quick freezing of fish, meats, poultry and other products, with explanation of temporary leap phenomenon and effects on animal tissues and juices; satisfactory achievements outlined. Dec: Experiments of quick freezing of fish, meats and other products in Reval, Estonia, Paris, France and Warrington, England, "Z" plants; microscopic research of physical changes in tissues of frozen fish.

E. I. 1930, 1500.

(1695) Zarotschenzeff, M. T., "Latest Achievments in Rapid Freezing and Chilling." Brit. Assn. Refrig. Proc. 27, No. 1, 69-92 & 95-106 (1930-31). - Cf. Ice and Cold Storage 34, No. 394, 4-6, 3 figs., (1931); Ice and Refrig. 80, No. 2, 140 (1931). Summary of achievements of rapid freezing; description of "Z" process; demonstration freezing plant at Fleetwood; operations on board trawlers.

E. I. 1931, 1205.

(1696) Zarotschenzeff, M. T., "Rapid Freezing and Chilling." Ice and Cold Storage 34, 3-4 (1931).

(1697) Zarotschenzeff, M. T., "The 'Z' Process." Zeit fuer Eis und Kaelte Industrie 24, No. 7, 73-76 (1931). - Effective method for rapid freezing, cooling and defrosting of perishable foodstuffs, developed by author and patented by Liverpool Refrigeration Co., England.

E. I. 1931, 1205.

(1698) Zarotschenzeff, M. T., "'Z' Process in America - New Type of Quick Freezing Machine." Ice & Cold Storage 36, No. 1, 41-5 (1932). - Illustrated description of quick freezing unit of continuous type, using "Z" process, yielding large output and requiring little labor and small space, designed for complete automatic "control"; review of results obtained in U. S. during 1932; retaining moisture without shrinkage; diagram for hardening ice cream by "Z" process.

E. I. 1933, 957.

(1699) Zarotschenzeff, M. T., "Dry and Wet Freezing in Meat Industry." Ice and Refrig. 82, No. 2, 133-8, No. 3, 315-6 (1932). - No. 2: Quick freezing offers stabilizing influence upon meat prices; effects of crystallization, freezer burn, etc., upon quality, appearance and economy of meat freezing; various methods in vogue in America and Europe; applying refrigeration when and where it is needed. No. 3: Rapid chilling; chilling of offal and trimmings; freezing of hams and bellies; meat product in package form; Australian report on quality of "Z" quick frozen meat in cartons.

E. I. 1932, 1112.

(1700) Zarotschenzeff, M. T., "'Z' Process in America." Ice & Refrig. 83, No. 2, 67-70 (1932). - Principles of process outlined by illustrations and description; effects of temperature and freezing time on water crystal formation and content in mammalian muscles of frozen products; influence of air, brine and atomized brine direct contact with frozen products.

E. I. 1932, 1111.

(1701) Zarotschenzeff, M. T., "'Z' Process Starts in America." Refrig. 32, No. 2, 22-4 (1932). - Patented process invented by M. T. Zarotschenzeff, employing direct expansion; freezing time for various products; continuous freezing.

E. I. 1932, 1111.

(1702) Zarotschenzeff, M. T. Theory and Practice of Chilling and Freezing Meats in Europe and in the U. S. Proceedings of the American Institute of Refrigeration, 1933. pp 202-26.

(1703) Zarotschenzeff, M. T., "Preservation of Poultry." Refrig. Eng. 26, No. 6, 311, 324-5 (1933). - Results of tests under supervision of U. S. Dept. of Agriculture, demonstrating superiority of quick-freezing by "Z" process to ordinary commercial sharp freezing. Cf. Ice & Cold Storage 36, No. 429, 212 (1933).

E. I. 1933, 959.

(1704) Zarotschenzeff, M. T., "Refrigeration of Fish in Newfoundland." Cold Storage 37, No. 431, 117-8 (1934). - Economic advantages of quick freezing; details of Otteson system.

E. I. 1934, 931.

(1705) Zarotschenzeff, M. T., "Old Problems in Fishing Industry and New Ways of Solving Them." Ice & Refrig. 87, No. 4, 183-4 (1934). - Illus. description of modern installation of battery of "Z" quick-freezing cabinets for fish in plant of Charlotte Fish and Oyster Co., Charlotte, N. C.; Commercial success of quick-freezing fish; construction details of freezing cabinet; cycle of operation of freezer.

E. I. 1934, 930.

(1706) Zarotschenzeff, M. T. and Conn, C. J., "Quick Freezing and Marketing of Ducks." Ice & Refrig. 91, No. 1, 51-7 (1936). - Description of plant at Riverhead, L. Is., N. Y. using "Z" quick freezing process.

E. I. 1936, 954.

(1707) Zarotschenzeff, M. T., "Quick Frozen Meat Supplies." Modern Refrig. 42, No. 501, 275-6 (1939). - Case made out for adoption of quick freezing on large scale for military and civilian food supplies, with resultant vast economies in war time transport and storage space.

E. I. 1940, 1024.

1708) Zarotschenzeff, M. T., "New Quick Freezing Method." Quick Frozen Foods 1, No. 6, 19, 47 (1939).

1709) Zarotschenzeff, M. T., "Full Drawn Poultry Quick Frozen in a 'Flexible Froster'." Ice & Refrig. 98, 329 (1940). - Quick-freezer based on rinciple of using a flexible, elastic refrigerating surface that contacts he product as completely as possible.. Liquid at very low temperature is irculated through a series of flat rubber bags with the product to be froen being placed between these flat rubber bags. The elastic rubber surace adapts itself to contour of product. Each bag connected to a header

and turn on valve lets in cold brine which fills the bag, expands it, and at same time the bag assumes the shape of the product. For unloading, the brine valve is closed, and brine drains off leaving product easy to remove. Neither ice nor flesh of product freezes to the rubber surface. Unit constructed for National Frosted Foods, Inc., New York., for quick freezing drawn poultry.

W. B. C.

(1710) Zarotschenzeff, M. T., "Quick Freezing from Labrador to Finland." Ice & Refrig. 104, No. 2, 99-101 (1943). - Author's method for preparing articles of meat and especially packing and preserving by quick freezing; preventing deterioration. Before Eastern Frosted Foods Assn.

E. I. 1943, 897.

(1711) Zarotschenzeff, M. T., "Quick Freezing of Meats in South America." Refrig. Eng. 46, No. 2, 88-91 (1943). - Description of quick freezing and packing plant built at Tierra del Fuego, southernmost tip of South America; construction and design problems and refrigeration practice followed; author predicts that lamb cuts frozen at this plant will be imported to North America, and importation of this product will accelerate development of domestic frozen meat products.

E. I. 1943, 897.

(1712) Zarotschenzeff, W., "'Z' Process in Norway." Ice & Refrig. 81, No. 2, 113-4 (1931). - Norwegian fish interests are paying much attention to quick freezing processes; new steamer operated by Norwegian firm has complete quick freezing plant for preparing fish at sea; insulated cardboard shipping containers used.

E. I. 1931, 1205.

(1713) Zarotschenzeff, W. M., "Quick Freezing Cherries by 'Z' Process. Ice & Refrig. 86, No. 1, 57-8 (1934). - Description of commercial application of cold pack method to berries; introduction of "Z" process of quick freezing to fruits and vegetables grown in northern counties of N. Y.; outline of quick freezing process used.

E. I. 1934, 931.

(1714) Zarotschenzeff, W. M., "Quick Freezing Progress in Japan." Refrig. Eng. 36, 197 (1938). - Three "Z Pack" quick freezing plants erected in Japan - two for fish and one for tropical fruits as mango, papaya, and pineapple. Processing foods by freezing is increasing in Japan - all types of seafood, fruits and vegetables are preserved in this manner. Some of their trawlers are equipped for quick freezing so that fish may be frozen immediately after catching.

F. F.

(1715) Zarotschenzeff, W. M., "Production of Z Pack Swordfish in Japan." Ice & Refrig. 96, No. 3, 239-41 (1939). - Description of first packaging and quick freezing plant in Japan put into operation in May 1938, for production of swordfish steaks by Nippon Kaiska, Ltd.

E. I. 1939, 1004.

(1716) Zeller, H. and Beller, K., "Survival of Swine Plague Virus in Pickled, Salted, and Frozen Meats." Centralbt. Bakt. (etc.) I Abt. Orig. 114, No. 4/6, 300-308 (1929). - Investigations on ninety hogs showed that neither pickling, dry salting nor preservation at low temperature for the ordinary storage period destroy the swine plague virus in the flesh, intestines or liver.

B. A. 4, 2746 (1930).

(1717) Zilva, S. S., Kidd, F., and West, C. The Effect of Freezing Upon Vitamin C of Apples. Dept. Sci. Res. Rept. Food Invest. Board 1932, 1933. pp. 89-90.- The loss of antiscorbutic activity was great in Bromley's Seedling apples that had been stored at -5° for seven months. In those stored at -10° and -15° the losses were about 50% and 15% respectively, and there was no loss in those that had been stored at -20°.

C. A. 27, 5384 (1933).

(1718) Zilva, S. S., Kidd, F., and West, C. The Effect on the Vitamin C Content of Apples in Storage in the Frozen State in the Presence and Absence of Molecular Oxygen. Dept. Sci. Ind. Res. Rept. Food. Invest. Board 1933, 1934. Page 80. - Cf. Abstract No. 1717. After storage for three months in air at -5°, the loss of vitamin C from apples was almost complete; at -10° the loss was about 70%. When stored in vacuo there was no loss in 6 months at -20° and about 25% loss at -10° and -5°.

C. A. 29, 242 (1935).

(1719) Zimmerman, W. I., Tressler, D. K., and Maynard, L. A., "Determination of Carotene in Fresh and Frozen Vegetables I. Carotene Content of Green Snap Beans and Sweet Corn." Food Research 5, 93-101 (1940). - The method of Russel, Taylor and Chichester for the determination of carotene (C. A. 29, 5473) slightly modified, gave good results for carotene estimation in vegetables. Biological assay showed that much of the pigment in Golden Cross Bantam sweet corn is not carotene. The sweet corn contained 0.6 - 1.2 micrograms carotene per gram by bioassay; snap beans 2.4 - 4.1 micrograms. No appreciable losses of carotene occured during the storage of vegetables at either -17.8° or at -40.0°.

C. A. 34, 2089 (1940).

(1720) Zimmerman, W. I., Tressler, D. K., and Maynard, L. A., "Carotene in Fresh and Frozen Vegetables by an Improved Method. II Carotene Content of Asparagus and Green Lima Beans." Food Research 6, 57-68 (1941). - Cf. Abstract No. 1719. Diacetone was used for extraction of total pigments, and a solution of diacetone for extraction of chlorophyl and xanthophyll from their solution in petroleum ether. The commercial processing (freezing) of broccoli, spinach, lima beans and asparagus results in no loss of carotene. Storage of these frozen vegetables at -40° C for five months similarly resulted in no carotene loss.

C. A. 35, 4112 (1941).

(1721) Zscheile, F. P., Beadle, B. W., and Kraybill, H. R., "Carotene Content of Fresh and Frozen Green Vegetables." Food Research 8, 299-313 (1943). - A study of the carotene contents of spinach, asparagus, broccoli, beet leaves, peas, green beans, Lima beans.

C. A. 38, 421 (1944).

(1722) Zumbro, F., "New Applications of Low Temperature Freezing." Refrig. Eng. 21, No. 4, 259-64 (1931). - Layout, equipment, design and operation of recent installations of low-temperature refrigeration; layout of plant for freezing fruit in packages; refrigeration for peach freezing; quick hardening of ice cream.

E. I. 1931, 1203.

Foreign Patents

Austrian

(1723) Aus. 24,306/35, Aug. 20, 1936, S. Le F. Varvel, Freezing Mixture. - Na_3PO_4 is added to an aqueous solution containing one or more substances capable of depressing the freezing point of the solution, to stabilize the freezing point and retard the temperature rise. Triethanolamine is added to coagulate the solution before it freezes.

C. A. 30, 8441 (1936).

British

(1724) Brit. 1,573, May 4, 1874, W. Mort, Improvements in the Preservation of Foods and Other Perishable Substances.

(1725) Brit. 3,052, Oct. 6, 1868, J. Jeffreys, Improvements in Freezing, Shipping, and Preserving Meats.

(1726) Brit. 5,269, Nov. 4, 1882, W. H. Thew, Preserving Foods, Etc.

(1727) Brit. 5,378, April 16, 1898, H. Rouart, Freezing Meat, Etc.

(1728) Brit. 13,760, June 12, 1912, N. Dahl, Preserving Victuals.

(1729) Brit. 14,111, June 11, 1914, A. H. Kilner, Food Flavor Preservation Process. - Bags or receptacles of paper or fabric for enclosing articles of food for cold storage are impregnated with viscose or other cellulose solution to render them practically impervious to air.

C. A. 9, 3359 (1915).

(1730) Brit. 16,916, Aug. 21, 1905, T. D. Kyle, Preventing the Decomposition of Fish.

(1731) Brit. 20,614, Dec. 23, 1889, W. Douglas and J. Donald, Improvements in Preserving Fish, Birds, Poultry, or Other Analogous Articles of Food.

(1732) Brit. 24,244, Oct. 23, 1912, A. J. A. Ottesen, Method of Freezing or Refrigerating Easily Damaged Food Commodities.

(1733) Brit. 23,126, Oct. 13, 1913, H. Bull, Cooling or Freezing Food Substance. - Apparatus for cooling or freezing food substance by immersing the food in cooled brine.

C. A. 9, 943 (1915).

(1734) Brit. 30,221, Dec. 29, 1910, J. R. Henderson, Fish Preservation. - Fish are preserved by cooling them in a chamber of about 35° F., and then treating them with sea water, to which about 15 per cent NaCl is added and which is cooled to about 15° F. Suitable apparatus is shown.

C. A. 6, 1646 (1912).

(1735) Brit. 144,368, Mar. 6, 1919, R. Mann, Cooling Fish, Etc.

(1736) Brit. 278,799, July 13, 1926, W. A. Heyman, Apparatus for Concentrating Fruit Juices by Freezing.

(1737) Brit. 292,457, June 18, 1927, C. Birdseye (to General Foods Co.), Apparatus for Freezing Packaged Meats or Other Foods, Etc.

(1738) Brit. 300,209, Nov. 8, 1927, J. E. W. Reeh, Preserving Food by Refrigeration. - See Fr. 643,666.

(1739) Brit. 302,447, Dec. 23, 1927, R. J. Allnutt (to Homfreeze Corp.), Frozen Food Products. - Frozen preparations are formed from agar sugar, water and flavoring substances such as fruit juices, fruit acids, and sugar.

C. A. 23, 4279 (1929).

(1740) Brit. 339, 172, Feb. 16, 1929, M. T. Zarotschenzeff, Preserving Foods Such as Fish or Meats. - The materials are rapidly chilled or frozen for preservation or transport by subjection to air saturated with a highly atomized liquid such as fresh or sea water or brine in the form of fog and at a low temperature (suitably about -22° to -25° C.) and may be subsequently defrosted by treatment with a fog-laden atmosphere at a temperature above freezing. Apparatus and details of procedure are described.

C. A. 25, 2494 (1931).

(1741) Brit. 355,322, July 1, 1929, Atlantic Coast Fisheries Co., Packing and Wrapping Fillets of Fish and Like Food Products. - Adherence of the fish pieces to one another is improved in preparing assembled pieces which may be frozen and sliced, by treatment with a mild alkaline brine or by permitting slight drying before wrapping.

C. A. 27, 352 (1933).

(1742) Brit. 454,220, Sept. 25, 1936, F. O. S. Bland, Cooling Mixtures. - A liquid freezing medium for use in the preservation of foods, etc., consists of a mixture of at least 2 aliphatic alcohols and water. The medium may be a mixture of polyhydric alcohol, e.g., glycerol, 20-40%, a monohydric alcohol, e.g., ethyl alcohol 20-40% and H_2O 20-45%. It may be purified in a filter that comprises a container having a rose for distributing the liquid over a filter bed consisting of layers of fuller's earth, MgO and active C, separated by filter cloths and a collector.

C. A. 31, 1529 (1937).

(1743) Brit. 471,638, Oct. 8, 1937, J. A. C. A. Hoveman, Freezing Food in Rubber Sheath.

(1744) Brit. 503,421, April 5, 1939, R. A. Craemer, Receptacles for Frozen Foods. - See Can. 369,293.

(1745) Brit. 513,466, Oct. 13, 1939, E. W. Flosdorf, Preserving Food Products and Biological Substances. - Liquid or semi-liquid foods, etc., are treated and preserved by exposure in a frozen condition in an enclosed chamber without external refrigeration to the action of a vacuum of 2.5 millimeters Hg or less and of a heat-regenerable desiccant, e.g., anhydrous $CaSO_4$, that draws only water vapor from the substances, from which the contained water is sublimed without loss of volatile constituents other than water and without exposure of the substances to acid or other deleterious vapor.

C. A. 35, 1889 (1941).

(1746) Brit. 523,946, July 25, 1940, W. S. Josephson and W. S. Josephson, Jr., Preserving Perishable Foods. - The vegetables or fruits are cooled to between 60° F. and 30° F. to remove the field heat as a preliminary step. The heat is then removed very rapidly, such as to -100° F. for peas in 1 minute. High pressure is maintained within the vessel.

C. A. 35, 6346 (1941).

(1747) Brit. 545,821, June 15, 1942, Sylvania Industrial Corp., Wrappers for Frozen Foodstuffs. - A wrapper, which will not become hard and stiff at low temperatures to which frozen food products are subjected, can be made from a nonfibrous hydrophilic organic colloid, containing a softener comprising a mixture of glycerol and diethylene glycol. Cf. U. S. 2,281,513.

C. A. 37, 2095 (1943).

Canadian

(1748) Can. 369,293, Oct. 12, 1937, R. A. Craemer, Receptacle for Frozen Foodstuffs. - Foods, liquid at normal temperatures and congealable into solid masses by refrigeration, are packaged by coating the wrapper with a material remaining fluent at a temperature at which the foods are dispensed, e.g., solutions of sugar or mixture of sugars comprising a palatable alcohol, such as ethyl alcohol, glycol or glycerol and an optimum amount of water, and various vegetable oils, e.g., walnut, sunflower, or poppyseed oil. Several examples are given.

C. A. 32, 2242 (1938).

(1749) Can. 396,705, May 20, 1941, H. A. Noyes and A. D. Little, Inc., Foods Frozen in Sugar Brine.

French

(1750) Fr. 449,815, Oct. 24, 1912, A. J. A. Ottesen, Process for Quick Solidification of All Elementary Foods.

(1751) Fr. 643,666, Nov. 8, 1927, J. E. W. Reeh, Preserving Foodstuffs. - Foodstuffs to be treated with a freezing liquid are first coated with a liquid, the freezing point of which is higher than that of the freezing liquid, so that the foodstuffs become protected by an envelope.
C. A. 29, 1446 (1929).

(1752) Fr. 844,800, Aug. 1, 1939, L. R. H. Nalpas, Cooling Liquids. - A method for cooling a liquid consists of immersing in the liquid an appropriate container made from a conductive material such as aluminum and containing a refrigerating mixture such as ice and sodium chloride.
C. A. 34, 7665 (1940).

German

(1753) Ger. 335,871, Apr. 16, 1921, L. Hirsh, Process for Preservation of Foods by Means of Freezing.

(1754) Ger. 533,194, Nov. 19, 1929, B. Hug, Apparatus for Sterilizing Fruit Juices by Electric Treatment.

(1755) Ger. 566,394, Oct. 17, 1928, R. Heiss, Freezing Meat With Cold Brine. - Discoloration of the meat is prevented by treating it with CO or H, preferably prior to freezing.
C. A. 27, 1062 (1933).

(1756) Ger. 579,306, June 23, 1933, H. Theurer, Apparatus for Producing Cold. - CO_2 is expanded in a fabric bag impregnated with a mixture of brine and ethyl alcohol or ether.
C. A. 27, 4448 (1933).

(1757) Ger. 611,991, April 12, 1935, W. Klapproth, Freezing Mixture. - The mixture consists of neutral aqueous solution of alkali salt of H_3PO_4 in high concentration. An addition of alkali borate may be given.
C. A. 29, 5706 (1935).

(1758) Ger. 673,417, Mar. 22, 1939, F. O. S. Bland, Liquid Medium for Preserving Foodstuffs by Refrigeration. - See Brit. 454,220.

U. S. Patents

(1759) U. S. Re. 1,097, Dec. 11, 1860, D. E. Somes (to J. S. Anderson), Improvement in Curing Provisions. - Claim 1. Salting and curing food and hides in any latitude and at times when the temperature at the surface of the earth is too high for the ordinary process, by means of: (a) operating in excavations or shafts made in the earth to a depth sufficient to attain the mean temperature of the earth, or to a depth at which meats have not heretofore been salted and cured, and (b) further, to cool by artificial refrigeration.

T. V. A., 99-192, p. 1.

(1760) U. S. Re. 2,096, Oct. 24, 1865, D. E. Somes, Improvement in Curing Provisions. - Claim 2. Improvement in curing provisions, by: (a) salting, curing, and preserving food, hides, etc., in shafts and vaults excavated in the earth to depth sufficient, practically, to attain the lowest invariable temperature of the earth at the place where they are sunk, and (b) cooling such excavations and shafts by artificial means.

T. V. A., 99-192, p. 1.

(1761) U. S. Re. 15,683, Sept. 4, 1923, P. W. Petersen, Method and Apparatus for Handling Comestibles. - Claim 1. Method of handling comestibles for refrigerating them substantially en masse by (a) arranging comestibles in regular formation to fill open scoop-shaped container, (b) placing said scoop-shaped container in open end of second upright thin-walled and watertight container wherein first container is fitted to slidingly engage therewith, and (c) immersing 2nd container in refrigerant to level not permitting entry of refrigerant into second container but substantially on par with or above level of comestibles contained therein.

T. V. A., 99-198, p. 3.

(1762) U. S. 30,658, Nov. 13, 1860, D. E. Somes (to J. S. Anderson), Improvement in Curing Provisions. - Claim 1. Salting and curing food and hides in latitudes too warm for the ordinary processes to be carried on, by means of: (a) operating in excavations made in the earth to a depth sufficient to attain the minimum temperature, and (b) further cooled by artificial refrigeration.

T. V. A., 99-192, p. 1.

(1763) U. S. 31,736, Mar. 19, 1861, E. Piper, Improvement in the Method of Preserving Fish. - The apparatus used in carrying out the method claimed consists of a box in which the fish are laid upon a rock, the rock being surrounded by a packing of charcoal or other non-conducting material. Metallic pans, filled with a freezing mixture, as salt and ice, are then set over the fish, and the cover is shut upon them, which causes the temperature to fall to 10° or 15° below the freezing point. Claim: Preserving fish or other articles in a closed chamber by means of a freezing mixture, having no contact with the atmosphere of the preserving chamber, substantially as set forth.

Pat. Off. Ann. Rept. I, 237 (1861).

(1764) U. S. 61,638, Jan. 29, 1867, D. E. Somes, Improvement in Cooling and Packing Meat. - Claim 1. Process of cooling and packing meat which comprises: (a) cooling air and liquids by means of forcing air through jets of water or spray, (b) cooling the meat by contact with said air and liquids and (c) producing rarefaction by a suction-blower or its equivalent.

T. V. A., 99-194, p. 1.

(1765) U. S. 74,247, Feb. 11, 1868, C. E. Richardson, Improvement in Preserving and Packing Meat. - Claim 1. Process of preserving and packing meat comprising: (a) subjecting meat to a suitable freezing mixture for a sufficient length of time to allow the meat to become solidly frozen thruout, (b) subjecting frozen meat to a brine solution prepared in known manner, (c) letting stand for several days in the brine, and (d) packing for the market.

T. V. A., 99-194, p. 1.

(1766) U. S. 85,913, Jan. 19, 1869, D. W. Davis, Freezing-Box for Fish, etc. - The freezing-box or pan, when constructed and used in the manner and for the purposes substantially as herein described.

Pat. Off. Ann. Rept. 1, (1869).

(1767) U. S. 109,820, Dec. 6, 1870, D. Y. Howell (to D. Y. Howell, T. S. Sprague, and H. F. Eberts), Device for Freezing Fish, Meats, etc. - Claim 1. The employment of sheets of metal, arranged in pairs in a suitable box, in connection with a freezing mixture, substantially as described, and for the purpose set forth. Claim 2. The arrangement, within the box A, of the sheet-metal plates B and blocks C, D, and E, substantially as and for the purpose herein set forth.

Pat. Off. Ann. Rept. II, 935 (1870).

(1768) U. S. 112,129, Feb. 28, 1871, S. H. Davis and D. W. Davis, Improvement in Preserving Fish by Freezing. - Claim 1. Process which comprises: (a) covering fresh fish or animal matter with thin sheet rubber or other waterproof material, and (b) freezing the foodstuff so covered.

T. V. A., 99-195, p. 1.

(1769) U. S. 112,294, Feb. 28, 1871, D. E. Somes, Improvement in Cooling, Freezing, and Preserving Solids, Liquids, and Gases. - Claim 1. Process of preserving food, hides, or other animal or vegetable substances by: (a) the application of cold to tight vessels, in which the same are placed, and (b) the conduction of the electricity therefrom.

T. V. A.,99-192, p. 2.

(1770) U. S. 161,596, April 6, 1875, D. W. Davis and S. H. Davis, Improvement in Preparing Fish for Market. - Claim 1. Mode of preparing fish for transportation and market by: (a) freezing them into cakes suitable to be packed in casks or other packages.

T. V. A., 99-195, p. 1.

(1771) U. S. 178,446, June 6, 1876, K. Knott, Improvement in Processes of Preserving Food. - Claim 1. Mode of preserving articles of food by: (a)

packing them, when cool or frozen, in a hermetically-sealed can or vessel, and (b) surrounding the said can or vessel by a body of flour contained within an outer case, the packing operation being conducted in an atmosphere whose temperature is the same, or as nearly as practicable the same, as that in which the articles have been cooled or frozen.

T. V. A., 99-192, p. 2.

(1772) U. S. 190,128, May 1, 1877, J. Campbell, Improvement in Processes of Preserving Meat in Transit. - Claim 1. Process for preserving meats in transit, which consists in: (a) packing packages of meat between layers in following order: (1) a layer of sawdust, (2) then a composition of salt, sal-ammoniac, niter and sulfate of soda, (3) then a layer of ice, (4) then a package of meat, (5) then sawdust again, and so on.

T. V. A., 99-194, p. 1.

(1773) U. S. 197,314, Nov. 20, 1877, J. J. Bate, Improvement in Processes for Preserving Meats During Transportation and Storage. - Claim 1. Process of preserving meat during transportation and storage by: (a) enveloping the same in a covering of fibrous or woven material, and (b) subjecting it when thus enveloped to the continuous action of a current of air of suitably low and regulated temperature.

T. V. A., 99-194, p. 2.

(1774) U. S. 226,390, April 13, 1880, D. W. Davis, Process of Preparing and Preserving Fish. - Claim 1. Process of preserving fish in a fresh state for market by: (a) packing the freshly-caught fish in ground or pulverized ice, in suitable packages, and (b) freezing the fish and pulverized ice together in a solid mass in the package.

T. V. A., 99-195, p. 1.

(1775) U. S. 249,434, Nov. 8, 1881, J. A. Whitney, Preservation of Meat by Refrigeration. - Claim 1. Method of preserving meat during transportation or storage by: (a) embedding the same in substantially dry refrigerated sand, grain, or equivalent material which adapts itself to the shape of the meat.

T. V. A., 99-194, p. 2.

(1776) U. S. 308,965, Dec. 9, 1884, W. M. Henderson, Process of Preserving Beer. - Claim 1. Process of preserving beer or its described equivalents, which consists in: (a) inclosing the same in a receptacle capable of being made air-tight, (b) cooling the same till it attains a solid condition, (c) maintaining it in such condition, in the manner described, (d) sealing the vessel, so as to prevent the ingress of air, and (e) allowing the contents to gradually liquefy.

T. V. A., 99-192-CR, p.l.

(1777) U. S. 558,298, Apr. 14, 1896, E. M. Nelson, Process of Thawing Frozen Food. - Claim 1. Process of thawing frozen meats which consists in: (a) drying the atmosphere of a closed chamber by causing the moisture to deposit on cold surfaces, (b) placing the meat to be thawed in the chamber and again closing it, and (c) raising the temperature of the chamber, whereby no moisture is deposited on the meat on its introduction to the chamber and whereby the exterior layers of the meat are not dried.

T. V. A., 99-194, p. 3.

(1778) U. S. 626,771, June 13, 1899, H. W. Happleye, Method of Preserving Fish, etc. - Claim 1. Process of preserving fish, flesh, fruits, and the like consisting in: (a) submerging material to be preserved in a liquid maintained at a temperature substantially that of, or below, the freezing point of the material.

T. V. A., 99-198, p. 1.

(1779) U. S. 709,751, Sept. 23, 1902, D. W. Davis, Process of Preserving Frozen Food Products. - Claim 1. Process of preserving fresh animal-food products, consisting in: (a) freezing the products to a temperature below freezing-point, (b) immersing the said products while in a frozen condition in water having a temperature of 32° F. to form an inclosing shell of ice about the products to thoroughly exclude the air therefrom without extracting the frost from the products, and (c) storing the products thus prepared without further treatment in a temperature below freezing-point.

T. V. A., 99-195, p. 2.

(1780) U. S. 1,055,636, Mar. 11, 1913, J. R. Henderson, Preserving Fish. - Cf. Brit. 30,221.

(1781) U. S. 1,058,682, Apr. 8, 1913, C. V. M. Atkinson, Method of Preserving the Natural Flavor of an Article of Food. - Claim 1. Process of preserving the natural flavor of an article of food consisting in: (a) enclosing the article in a paper envelope which is substantially impervious to air, (b) placing the article in cold storage while enclosed in said envelope to preserve the flavor of the article from injurious effects of cold storage, the envelope serving also as a cooking bag when the article is removed from cold storage.

T. V. A., 99-192, p. 4.

(1782) U. S. 1,059,597, Apr. 22, 1913, E. T. Clair (to Sulzberger & Sons Co.), Thawing Frozen Meat. - Thawing frozen meat while confined in air ("fluid medium") under pressure.

C. A. 7, 2076 (1913).

(1783) U. S. 1,123,701, Jan. 5, 1915, N. Dahl, Process of Refrigerating Fish, etc. - Claim 1. Method of cooling and freezing fish and other articles of food, especially during transport, by the use of a cooling liquid in direct contact with the article or its several parts, which consists in: (a) inserting the article in its natural unfrozen condition into actual packing in which it is to be stored or transported, and (b) causing the cooling liquid having a temperature below 0° C. to circulate thru the packing and between the articles contained therein until the article has been cooled and frozen throughout.

T. V. A., 99-195, p. 2.

(1784) U. S. 1,129,716, Feb. 23, 1915, A. J. A. Ottesen, Preserving Fish, Meat, Fruits, etc. - Preserving fish, meat, fruits, etc., by immersion in a solution of NaCl which at the beginning of the treatment is at or near the freezing point so that a layer of ice immediately forms on the surface

of the material and prevents penetration of the solution (during subsequent refrigeration).

C. A. 9, 1082 (1915).

(1785) U. S. 1,129,868, Mar. 2, 1915, A. A. Hoy, Meat Product and Process for Producing the Same. - Claim 11. Process of making food products consisting in: (a) freezing fresh meat until rigid and (b) comminuting the same.

T. V. A., 99-194-CR, p. 2.

(1786) U. S. 1,140,178, May 18, 1915, A. M. McDougall, Method of Preserving and Marketing Fresh Fish. - Claim 1. Method of preserving fish consisting of: (a) placing the fish within an air-tight carton, (b) placing a number of cartons within a larger package, and (c) freezing the series of cartons into a solid unit or mass.

T. V. A., 99-195, p. 2.

(1787) U. S. 1,177,308, Mar. 28, 1916, N. Dahl, Apparatus for Cooling and Freezing Fish and Other Food Substances. - Claim 1. In cooling liquids by passing the same through a container in which it is subjected to a cooling influence in passing repeated times in alternating directions within the container, an arrangement in cooling or freezing plants which operate with a circulating cooling liquid comprising: (a) a container provided with partitions arranged in such a manner that the liquid to be cooled is caused to pass in an alternating continuous stream through compartments formed between the partitions in contact with cooling pipes and a freezing medium, said freezing medium being placed within the compartments whereby to cause the liquid during its course through the cooling container to rapidly acquire a low temperature.

T. V. A., 1937 Report, p. 7.

(1788) U. S. 1,182,116, May 9, 1916, A. W. Thornton, Process for Treating Honey. - Claim 9. Process of treating honey which comprises the steps of: (a) freezing honey in the comb, (b) cutting the frozen honey into individual portions, (c) draining said portions and grading the same according to size, (d) wrapping each of said portions of the proper size in waterproof paper, and (e) packaging the drained honey and unwrapped portions by mass.

T. V. A., 99-192-CR, p. 4.

(1789) U. S. 1,201,552, Oct. 17, 1916, H. J. Bull, Method of Preparing Fish for Transport. - Claim 1. Method of preparing fish for transport which comprises: (a) packing the fish in a peripheral frame between perforate covers, (b) passing a freezing medium thru said covers and the contents of said frame, and (c) removing the covers.

T. V. A., 99-195, p. 3.

(1790) U. S. 1,235,661, Aug. 7, 1917, N. Dahl, Freezing Fish and Other Goods in Cases or Freezing Molds. - Claim 1. Method of freezing fish and other goods in cases or freezing molds which consists in: (a) packing and arranging the pieces of goods in such a manner in the case that each single piece is substantially parallel to the other pieces of goods, and (b) passing cooling fluid thru the goods in a direction substantially parallel to the longitudinal direction of the said pieces of goods.

T. V. A., 99-195, p. 3.

(1791) U. S. 1,247,261, Nov. 20, 1917, L. L. Goodrich, Process for Preserving Unhusked Green Corn. - Claim 1. Process of preserving ears of green corn, consisting: (a) subjecting ears of corn with husks thereon for a period substantially of 24 hours to a temperature substantially of 28° F., (b) thereafter subjecting same to and maintaining it at a temperature substantially of 4 or 6° F. until congelation of ears is effected.

T. V. A., 99-193, p. 2.

(1792) U. S. 1,281,828, Oct. 15, 1918, F. E. Pierson, Food Product and Process of Making Same. - Claim 1. Process for the treatment of corn consisting: (a) removing the hulls from the corn, (b) subjecting the hulled corn to the action of acetic acid, (c) subjecting it to freezing while moist with the acid.

T. V. A., 99-193-CR, p. 1.

(1793) U. S. 1,367,024, Feb. 1, 1921, N. Dahl, Freezing of Fish and Other Articles of Food. - Claim 1. In the freezing of fish and other goods in cases or other packing by means of currents of freezing liquid the process comprising: (a) subjecting the packed goods to a preparatory freezing by means of freezing liquid introduced directly into the interior of the packing, (b) packing and completing the freezing by means of freezing liquid supplied at the top of the case or packing.

T. V. A., 99-198, p. 1.

(1794) U. S. 1,388,295, Aug. 23, 1921, P. W. Petersen, Refrigerating Apparatus. - Claim 1. In a refrigerating apparatus, a tank containing a refrigerant, compartments therein embodying means for supporting comestibles during their refrigeration, the space without said compartments being approximately equal to the space within said compartments, and means for circulating said refrigerant downwardly through said compartments and around said comestibles.

Off. Gaz. 289, 643 (1921).

(1795) U. S. 1,388,296, Aug. 23, 1921, P. W. Petersen, Container for Comestibles. - Claim 1. A container for comestibles comprising a rectangular box member and a telescopic lid therefor, the ends of said box and of said lid being closed and the sides thereof being perforated to permit a transverse flow of a refrigerant through the container.

Off. Gaz. 289, 643 (1921).

(1796) U. S. 1,388,297, Aug. 23, 1921, P. W. Petersen, Rack for Comestibles. - Claim 1. A rack for comestibles adapted to be immersed in a refrigerant and comprising an open-work frame to permit the comestibles held in said rack to come in direct contact with the refrigerant, a plurality of side-by-side partitions supported in said frame, said partitions being perforated to form a plurality of transverse and superposed rows of pigeon holes that are severally adapted to support comestibles longitudinally of their length, the pigeon holes in one row being staggered with respect to those in the adjacent row.

Off. Gaz. 289, 644 (1921).

(1797) U. S. 1,388,298, Aug. 23, 1921, P. W. Petersen, Method of Preserving Comestibles. - Claim 7. Process of preserving a comestible consisting:

(a) refrigerating the comestible by direct contact with a brine solution, (b) washing off the refrigerated comestible with plain water, (c) glazing the comestible, (d) freezing the comestible in cold air.

T. V. A., 99-198, p. 2.

(1798) U. S. 1,420,739, June 27, 1922, P. W. Petersen, Method of Preserving Comestibles. - Claim 6. Process of preserving meat and other comestibles by refrigeration consisting: (a) immersing the comestible in a substantially isotonic bath to restore the comestible to substantially its original state and composition, (b) immersing the comestible in a refrigerating bath comprising organic material wherein said comestible is frozen.

T. V. A., 99-198, p. 2.

(1799) U. S. 1,420,740, June 27, 1922, P. W. Petersen, Method of Preserving Comestibles. - Claim 1. In the art of preserving meat the step comprising: (a) precooling the meat in a bath comprising water and glycerine mixed in such proportion that the osmotic pressure of said bath is substantially equal to the osmotic pressure of the natural liquid content present in the meat.

T. V. A., 99-198, p. 2.

(1800) U. S. 1,422,126, July 11, 1922, P. W. Petersen, Method and Apparatus for Handling Comestibles. - Claim 1. Method of handling comestibles for refrigerating them substantially en masse by: (a) arranging comestibles in regular formation to fill open scoop-shaped container, (b) placing said scoop-shaped container in open end of second upright thin-walled and water-tight container wherein first container is fitted to slidingly engage therewith, and (c) immersing second container in refrigerant to level not permitting entry of refrigerant into second container but substantially on par with or above level of comestibles contained therein.

T. V. A., 99-198, p. 3.

(1801) U. S. 1,422,570, July 11, 1922, W. B. Hardy and J. J. Pique, Apparatus for Cooling and Freezing of Fish and the Like. - Claim 1. In a device for freezing perishable articles, a tank having a feed opening, an inner chamber, a gutter disposed within the tank for directing articles to the interior of the inner chamber, a cover for closing the feed opening, a chute for directing articles to the gutter, means for supplying and regulating a quantity of fluid to the inner chamber, and agitating means operating in the inner chamber.

Off. Gaz. 300, 310 (1922).

(1802) U. S. 1,422,627, July 11, 1922, J. C. Shaw, Process of Chilling and Freezing Animal Substances. - Claim 1. Process of chilling and freezing animal substances consisting in: (a) initially chilling or cooling the meat under a continuous partial vacuum, (b) thereafter freezing the same.

T. V. A., 99-194, p. 4.

(1803) U. S. 1,431,328, Oct. 10, 1922, J. J. Pique, Cooling and Freezing of Fish and the Like. - Claim 1. An apparatus for cooling or freezing fish or the like, comprising in combination a receptacle within which the fish are placed, a tank containing a suitable cooling medium, means for moving said receptacle through the tank, and means for simultaneously rotating the re-

ceptacle, whereby a shuffling of the fish takes place, substantially as set forth.

Off. Gaz. 303, 219 (1922).

(1804) U. S. 1,458,991, June 19, 1923, J. J. Pique, Cooling and Freezing of Fish and the Like. - Claim 1. In an apparatus for cooling or freezing fish and like foodstuffs, the combination with a receptacle into which the fish may be tumbled, said receptacle having the shape of an oblong box without a lid and being of U-section, of a paddle extending substantially the length of the receptacle and fitting more or less closely against the semicylindrical sides thereof, means for rotating said paddles, curved blades arranged radially on said paddles, a conveying chain cooperating with said receptacle, and means for alternately keeping the receptacle in a fixed position on said conveying chain and permitting rotational freedom between the receptacle and said chain, substantially as set forth. Claim 6. In an apparatus for cooling or freezing fish and the like, the combination with a tank containing brine and the like, a plurality of receptacles for fish andthe like, an endless chain for conveying said receptacles through said cooling tank, rotational means within each receptacle, means for successively and automatically charging each receptacle with a predetermined quantity of fish and the like, and means for automatically emptying said receptacles when they leave the cooling tank, of a glazing tank arranged to receive the frozen contents from said receptacles, and an endless conveyor for carrying said contents through the glazing tank and out therefrom and delivering the same into boxes and the like for despatch or storage, substantially as set forth.

Off. Gaz. 311, 555 (1923).

(1805) U. S. 1,465,028, Aug. 14, 1923, A. E. Stacey, Jr. (to Carrier Engineering Corp.), Method of and Apparatus for Chilling Materials Such as Meat. - Claim 1. Method of cooling material, such as meat, which gives off heat and moisture, consisting in: (a) maintaining the material in an atmosphere having a humidity below saturation, (b) maintaining a relatively small difference between the vapor pressure corresponding to the temperature of material and vapor pressure of atmosphere in room containing material, (c) maintaining temperature in the room below temperature of material whereby material will be chilled with a relatively small vaporization of moisture therefrom.

T. V. A., 99-194-CR, p. 3.

(1806) U. S. 1,468,050, Sept. 18, 1923, H. F. Taylor, Refrigerating System. - Claim 1. The method of treating fish or other goods having one long dimension, which consists in suspending them in substantially vertical position, passing a liquid refrigerating medium over them longitudinally of their length, and utilizing the vertical suspension for insuring the effective drainage of said medium therefrom.

Off. Gaz. 314, 454 (1923).

(1807) U. S. 1,480,607, Jan. 15, 1924, J. A. Ford, Process of Treating and Preserving Cherries. - Claim 1. Process of treating and preserving cherries consisting: (a) chilling them before pitting, (b) removing the pits, (c) packing the pitted cherries in air tight containers, (d) freezing them.

T. V. A., 99-193, p. 2.

(1808) U. S. 1,485,755, Mar. 4, 1924, A. U. Alcook ($\frac{1}{2}$ to H. J. Wagstaff), Electric Process for Thawing Carcasses of Frozen Meat and the Like. - Claim 1. Method of thawing frozen carcasses which consists in: (a) subjecting the same to the thermal effect of an electric current whereby each carcass forms part of an electric circuit and is adapted to offer sufficient resistance to said current to raise the temperature of the carcass to normal.

T. V. A., 99-194, p. 4.

(1809) U. S. 1,487,883, Mar. 25, 1924, P. W. Petersen, Comestible Container. - Claim 11. Process of treating a container for the storage of comestibles therein comprising: (a) lowering the temperature thereof to a point below 32° F., (b) immersing the empty container in a bath of water for a short period of time whereby firmly adhering glaze of ice is imparted to the surfaces thereof.

T. V. A., 99-192-CR, p. 4.

(1810) U. S. 1,489,144, Apr. 1, 1924, Z. Ogura, Process of Refrigeration of Meat and Other Provisions. - Claim 1. Process of refrigerating meat and other provisions, which consists in: (a) first coating them with a fatty substance which is not penetrable by water, and (b) then immersing them in a salt solution of low temperature.

T. V. A., 99-198, p. 3.

(1811) U. S. 1,509,850, Sept. 30, 1924, C. J. Thompson and P. W. Petersen (to P. W. Petersen), Method of and Apparatus for Refrigerating Comestibles. - Claim 1. Method of handling comestibles for refrigerating them en masse into a solid mold subdivisible into sections of predetermined dimensions which consists in: (a) arranging and retaining said comestibles in regular order and in separate groups in a scoop-shaped container by interposing partitioning members between groups, and (b) refrigerating packed comestibles to freeze said partitioning members in situ with comestibles whereby frozen mold may be subsequently subdivided into separate groups along lines coincident with partitioning members.

T. V. A., 99-198, p. 4.

(1812) U. S. 1,511,824, Oct. 14, 1924, C. Birdseye, Method of Preserving Piscatorial Products. - Claim 1. Process which consists in: (a) cleaning and dressing fish ready to cook, (b) packing it in form to provide independent units, (c) immersing said forms in a refrigerating medium to solidify said units, (d) withdrawing said forms from said medium after their contents have become frozen, (e) removing said frozen units as individual blocks, (f) wrapping said blocks, and (g) packing said blocks in heat-insulated containers for shipping.

T. V. A., 99-195, p. 4.

(1813) U. S. 1,520,811, Dec. 30, 1924, D. J. Davis, Method of Freezing and Preserving Perishable Products. - Claim 1. Process of preserving perishable products comprising: (a) placing the material to be preserved in a container and between spacing means arranged between the products to be preserved and the walls of the container, (b) submerging the material in the container with a freezable liquid, (c) freezing the contents of the container into a solid block.

T. V. A. 99-198, p. 4.

(1814) U. S. 1,527,562, Feb. 24, 1925, R. E. Kolbe, Method of and Apparatus for Freezing Materials. - Claim 1. Process of freezing materials consisting: (a) confining them in an inverted air-trapping receptacle, (b) submerging the receptacle in a liquid freezing medium.

T. V. A., 99-198-CR, p. 2.

(1815) U. S. 1,528,890, Mar. 10, 1925, P. W. Petersen, Apparatus for Refrigerating Comestibles. - Claim 1. An apparatus for refrigerating comestibles comprising a top supporting plate having a peripheral and downwardly extending flange, a plurality of spaced side-by-side containers suspended from said plate, a plurality of spaced bracing strips embracing said containers and having their ends secured to said top plate, and spacing members interposed between said containers at their lower portions and secured to said bracing strips.

Off. Gaz. 332, 335 (1925).

(1816) U. S. 1,528,891, Mar. 10, 1925, P. W. Petersen, Apparatus for Refrigerating Comestibles. - Claim 1. An apparatus for refrigerating comestibles in a refrigerating liquid comprising a compartment having an open end, certain of the wall edges at said open end being flexible and provided with channels composed of flexible material for receiving refrigerating liquid adhering to the walls of the container where the container is tilted for emptying, said wall edges together with said channels being of a flexible construction to facilitate removal of the comestible.

Off. Gaz. 332, 335 (1925).

(1817) U. S. 1,532,931, Apr. 7, 1925, A. J. A. Ottesen, Process for the Direct Cooling of Goods. - Claim 1. Process for refrigerating or freezing goods comprising: (a) subjecting the goods to the direct action of a liquid comprising cool brine and glycerine.

T. V. A., 99-198, p. 4.

(1818) U. S. 1,547,258, July 28, 1925, J. W. Newton, Single Tank Comestible Brine Freezer. - Claim 1. Process of uniformly cooling and freezing comestibles whereby they may be shipped to great distances without glazing consisting: (a) bodily submerging the comestibles in a substantially saturated brine of a temperature close to freezing, thereby raising its temperature, (b) removing said brine from the top, (c) causing the brine thus removed to flow over a mass of crushed ice, (d) adding to said removed portion a solution of salt and water, thereby lowering the temperature and raising the specific gravity of the mixture thus formed, and (e) returning said mixture to said first mentioned brine from below in the form of jets of substantial velocity whereby the comestibles may be moved about in all directions so they may be individually frozen and in a uniform manner.

T. V. A., 1937 Report, p.29.

(1819) U. S. 1,562,280, Nov. 17, 1925, J. J. Barry ($\frac{1}{2}$ to W. T. Gamage), Machine for Treating Foods. - Claim 1. In combination, a cylindrical tank, a rotatable package carrier mounted within said tank, said carrier having a plurality of package receiving troughs extending axially of the tank, a coil of refrigerating pipe surrounding said carrier in spaced relation to the tank and carrier, the coils of the pipe being separated to constitute a continuous spiral passage into which the packages on the carrier extend,

the interior wall of the tank serving to confine the packages in position between said coils during the turning of the carrier for progressing the packages from one end of the coil to the other, said carrier comprising a shaft extending through the tank, a pair of spiders mounted on said shaft in spaced relation to one another, said spiders having radial arms, a continuous platform extending between said arms and constituting the bottom of the trough, said platform being spaced inwardly from the free ends of said arms.

Off. Gaz. 340, 804 (1925).

(1820) U. S. 1,562,360, Nov. 17, 1925, A. J. A. Ottesen, Direct Cooling of Goods. - Claim 1. Process for preservation of goods by refrigeration consisting: (a) exposing the goods to the direct action of a cooled solution of salts or other compounds whereby temperature below freezing point is obtained, (b) removing the substances contained in the solution which are retained on the surfaces of the cooled goods by exposing the goods to the action of a solvent in a tepid or hot state.

T. V. A., 99-198, p. 5.

(1821) U. S. 1,564,599, Dec. 8, 1925, J. G. Magaw and A. S. Magaw, Preserving Fruits. - Fruits and berries are preserved (without addition of water) by adding dextrose to them subjecting the mixture to freezing temperature, and maintaining approximately a zero temperature until ready for use.

C. A. 20, 463 (1926).

(1822) U. S. 1,582,858, April 27, 1926, M. Rezos (to Olney Preserving Company), Preserving Berries, etc. - Berries, grapes, cherries or similar foods are washed in a dilute gum tragacanth solution, packed with a relatively small proportion of sugar, and frozen.

C. A. 20, 2034 (1926).

(1823) U. S. 1,586,898, June 1, 1926, A. B. Haslacher, Method of Freezing and Transporting Perishable Food Products. - Claim 1. Process of keeping, handling and preserving food products consisting in: (a) depressing said product within a body of water, (b) freezing the mixture while held so depressed.

T. V. A., 99-192, p. 4.

(1824) U. S. 1,595,426, Aug. 10, 1926, T. B. Slate (to International Patents Holding Corp.), Refrigerating Apparatus. - Claim 7. Transportation package consisting in: (a) a vented protective casing of insulating material having packed therein a quantity of freezable product in freezing proximity to a quantity of frozen carbon dioxide sufficient to afford the desired amount of refrigeration.

T. V. A., 99-192-CR, p. 5.

(1825) U. S. 1,608,832, Nov. 30, 1926, C. Birdseye, Food from Fish. - Claim 2. A process of preparing fish consisting in reducing fresh fish to fragments thereby rupturing cells of the fish flesh and uniting said fish flesh in a solidified homogeneous mass by the gluey content of the opened cells. Claim 5. A food product consisting of a homogeneous solidified mass of fresh raw fish having not less moisture than that contained in the fish from which the fragments were prepared.

Off. Gaz. 352, 1185 (1926).

(1826) U. S. 1,614,455, Jan. 18, 1927, A. H. Cooke, (to Atlantic Coast Fisheries Corporation of New York), Refrigerating Apparatus. - Claim 1. A refrigerating device having a series of double-walled containers, said containers arranged so that the bottom of one container forms the cover for the next lower container, and means for circulating a refrigerating medium between the walls of each container.

Off. Gaz. 354, 555 (1927).

(1827) U. S. 1,617,630, Feb. 15, 1927, N. H. Gay, Process of Precooling Fruits and Vegetables and Other Perishable Commodities for Shipment. - Claim 1. Process of preparing fruit or the like for shipment comprising: (a) picking fruit after it has fully ripened on the vine, (b) immediately submerging the said fruit in a cooling fluid, (c) maintaining said fruit immersed until the vine heat is removed therefrom and the fruit is thoroughly chilled to the center thereof and without freezing, and (d) then immediately placing said fruit while chilled in a refrigerating compartment for shipment.

T. V. A., 99-198, p. 5.

(1828) U. S. 1,621,257, Mar. 15, 1927, D. E. Knowlton and E. W. Donnigan, Method of Handling and Preserving Fish and the Like. - Claim 1. Method of preserving comestibles such as fish, which consists in: (a) packing the comestibles in shallow receptacles, (b) freezing the comestibles while in said receptacles to freeze the comestibles into shallow cakes in the receptacles, and storing said receptacles with the frozen cakes still contained therein and leaving the comestibles in said receptacles during the storage period, and (c) maintaining the comestibles in the frozen condition during said storage period.

T. V. A., 99-195, p. 4.

(1829) U. S. 1,631,974, June 14, 1927, W. B. McLaughlin, Preserving Fruits. - Apples, peaches or other fruit is mixed and finely comminuted with sugar before fermentation occurs and the temperature is maintained sufficiently low to effect preservation (until it is self-preserving).

C. A. 21, 2514 (1927).

(1830) U. S. 1,641,441, Sept. 6, 1927, R. E. Kolbe, Freezing Method. - Claim 1. Process of freezing materials consisting: (a) establishing a moving liquid having a freezing point below that of the material to be frozen and having a temperature below the freezing point of the material to be frozen, (b) arranging the material to be treated in buoyant receptacles, (c) subjecting the receptacles to movement thru the flow of the liquid and to the temperature of the liquid as it is moved.

T. V. A., 99-198-CR, p. 3.

(1831) U. S. 1,660,045, Feb. 21, 1928, P. W. Petersen, Apparatus for Handling Comestibles. - Claim 1. A container for fish or comestible units of like shape which comprises flexible but self-supporting sheet metal bent longitudinally upon itself and with certain of the resulting corresponding edges sealed together to form an envelope with an opening at its top edge, the edge formed by the longitudinal bend being rounded, the edge opposite said bend and the bottom edge being sealed in the shape of sharp ridges.

Off. Gaz. 367, 644 (1928).

(1832) U. S. 1,668,903, May 8, 1928, A. B. Haslacher, Preserving Vegetable Food Products. - Corn on the cob, peas, or other vegetable material is heated with water to a temperature of about 99° C. and is afterward frozen while immersed in water. (Prior to freezing, the immersed produce is subjected to a vacuum to extract any entrained air.)

C. A. 22, 2220 (1928).

(1833) U. S. 1,681,009, Aug. 14, 1928, P. W. Petersen, Refrigerating and Preserving Fish, Meat or Other Foods. - Foods such as fish or meat are washed in a solution containing a germicidal agent such as NaOCl, frozen with the solution remaining on the surface of the material, and then coated with ice.

C. A. 22, 3713 (1928).

(1834) U. S. 1,689,965, Oct. 30, 1928, P. W. Petersen, Refrigerating Method and Apparatus. - Claim 1. Apparatus for refrigerating comestibles comprising a plurality of portable open top comestible containers for insertion into a body of refrigerating liquid, frame members having flanges for engaging each container and mounted over the body of liquid for carrying the weight of said containers while immersed in the liquid, and spaced means for holding the top edges of each container horizontally spaced from said frame members whereby refrigerant drip from others of said portable containers is prevented from draining into the open top of the container from said members.

Off. Gaz. 375, 1184 (1928).

(1835) U. S. 1,708,253, Apr. 9, 1929, J. W. Bell and T. J. Bell, Method of Cleaning and Precooling Vegetables for Shipment. - Claim 1. Method of preparing vegetables, which comprises: (a) subjecting the vegetables to be prepared in a continuous path to a preliminary cleansing for the removal of superfluous vegetation and adhering foreign matter, (b) then submitting said vegetables to impinging jets of wash-water applied in opposition to the path of travel of said succession of vegetables, (c) then cooling said vegetables and removing excess of moisture.

T. V. A., 99-193-CR, p. 1.

(1836) U. S. 1,724,122, Aug. 13, 1929, F. Berdolt (½ to M. E. Berdolt), Refrigerating Apparatus. - In a refrigerating apparatus, a brine tank open at the top and resting upon and forming a closure for the brine tank, said housing being adapted to contain water, a second housing open at the top and within and spaced apart vertically and horizontally from said first housing, said second housing being adapted to contain a freezing mixture, a third housing open at the top and within and spaced apart vertically and horizontally from said second housing, said third housing being impermeable to the freezing mixture of the second housing, and means for closing the top of said first housing, and a drain from the lower part of the second housing to said brine tank.

Off. Gaz. 385, 355 (1929).

(1837) U. S. 1,729,893, Oct. 1, 1929, S. E. Oliver, Preserving Fresh Fruit. - The temperature of the fruit is reduced to about 1° C. and the temperature of the sugar is reduced to about -1° C. and the fruit and sugar are then packed in a container in such a manner as to isolate the individual

fruit from each other and from the container walls, while the temperature is maintained, and the container is then sealed.

C. A. 23, 5518 (1929).

(1838) U. S. 1,731,476, Oct. 15, 1929, E. P. Stevenson (to Arthur D. Little, Inc.), Process for Treating Citrus Fruits for the Recovery of Products Thereof. - Claim 5. Process of preparing derivatives from citrus fruit comprising as steps completely freezing the fruit, removing the oil cell layer of the peel and subjecting the frozen fruit to breakage by impact acting to break the peel away from the juice cells, and to separate the frozen juice cells, and separating the frozen peel fragments from the frozen juice cells.

Off. Gaz. 387, 564 (1929).

(1839) U. S. 1,738,706, Dec. 10, 1929, W. J. Hoffmann, Heat-Exchange Apparatus Suitable for Cooling Foodstuffs. - Structural features. Claim 4. In a heat exchanger the combination of a carrier, lateral temperature changers and a horizontal temperature changer over which the carrier passes, said horizontal temperature changer being separated from said lateral temperature changers, said temperature changers comprising plates separately constructed so as to permit moisture thereof to drip free of the carrier, and means for causing a rapid air circulation and limiting the space in which said air circulation takes place.

C. A. 24, 900 (1930);
Off. Gaz. 389, 368 (1929).

(1840) U. S. 1,757,628, May 6, 1930, A. B. Hale, Spray Device. - Claim 1. A spray device comprising in combination, a spray orifice, a spray head slidably positioned therein, a piston rigidly secured to said spray head, means whereby increase of pressure within said device may act upon said piston to draw said head toward said orifice, and means to prevent the complete closure of the orifice by said head.

Off. Gaz. 394, 207 (1930).

(1841) U. S. 1,759,682, May 20, 1930, C. Birdseye (to Frosted Foods Co., Inc.), Method of Preparing Consumer Packages. - Claim 1. Process of preparing consumer packages of a perishable food product consisting in: (a) enclosing the product in a container having walls to shape the product and a surface presenting a substantial area of thin flexible pellicle, (b) freezing the product while so shaped and confined by contact of a heat-conductive member coextensive with its pellicle-covered area.

T. V. A., 99-192, p. 5.

(1842) U. S. 1,769,087, July 1, 1930, M. P. Vucassovich, Freezing Apparatus. - Claim 1. Freezing apparatus comprising a substantially horizontal container internally partitioned to form a sinuous runway, which includes elongated major portions extending side by side, and shorter neck portions connecting the major portions in pairs, the runway being adapted to conduct a moving refrigerating liquid and buoyant receptacles floating thereon, in a sinuous path extending from a loading to a discharging point, said apparatus being characterized by means cooled by flowing a refrigerating liquid thereover to cause an upward transference of latent heat from the top surfaces of the charges.

Off. Gaz. 396, 174 (1930).

(1843) U. S. 1,769,088, July 1, 1930, M. P. Vucassovich, Freezing Apparatus. - Freezing apparatus comprising a substantially horizontal container internally partitioned to form an elongated runway having a landing end and a discharge end, and adapted to conduct a moving refrigerating liquid, and buoyant receptacles floating thereon, from the loading to the discharge end, said apparatus being characterized by movable heat-conducting deflectors, formed as covers adapted to bear separably on and float with said receptacles, and having liquid distributing upper surfaces, and means for discharging a refrigerating liquid upon said surfaces and thereby causing upward transference of latent heat from the contents of the receptacles through the deflectors, said deflectors being movable with the receptacles covered thereby through the receiving and discharge ends of the runway to permit the defrosting of the deflectors outside of the runway, and the utilization of portions of the frost coatings on the under sides of the deflectors, to hold charges placed thereon in close proximity to the deflectors and above charges placed on the bottoms of the receptacles.

Off. Gaz. 396, 174 (1930).

(1844) U. S. 1,772,424, Aug. 5, 1930, E. D. Kohr, Freezing Apparatus. - Claim 1. A freezing apparatus comprising a stationary refrigerant container, a rotatable ingredient container within the refrigerant container, means for delivering ingredients to the ingredient container at the forward end thereof, means for conducting the ingredients from the rearward end of the ingredient container, a plurality of disks within the ingredient container, a plurality of combined agitator and tie rods connecting the disks together, and a scraper blade carried by the disks and extending at an inclination to the axis of the ingredient container for constantly working the ingredients toward the rearward end thereof, said combined agitator and tie rods being arranged eccentrically of the ingredient container and extending at inclinations to the axis thereof.

Off. Gaz. 397, 156 (1930).

(1845) U. S. 1,773,079, Aug. 12, 1930, C. Birdseye (to Frosted Foods Co., Inc.), Method of Preparing Food Products. - Claim 1. Method of packaging and preserving food which consists in: (a) first packing the food in the container in which it is to be marketed and (b) freezing the same under pressure applied to substantial surface areas of the packed container.

T. V. A., 99-198-CR, p. 3.

(1846) U. S. 1,773,080, Aug. 12, 1930, C. Birdseye (to Frosted Foods Co., Inc.), Animal Food Product. - Claim 1. An article of manufacture comprising: (a) a marketable package containing frozen animal tissue which has been frozen in the package and which fills said package with a minimum of air voids, said package being substantially no greater in thickness than the same package before having been frozen, the contained animal tissue having in its frozen condition substantially the same cellular structure as it had before it was frozen and retaining its pristine qualities and flavors.

T. V. A., 99-194, p. 4.

(1847) U. S. 1,773,081, Aug. 12, 1930, C. Birdseye (to Frosted Foods Co., Inc.), Refrigerating Apparatus. - Claim 1. An apparatus for freezing foods comprising two heat conductive plates supported in spaced relation and adjustable in their spaced relation to engage and compress between them food products of varying thicknesses, and means to maintain said plates at a

freezing temperature while engaging said food therebetween, whereby said food is frozen through the agency of said plates.

Off. Gaz. 397, 354 (1930).

(1848) U. S. 1,775,549, Sept. 9, 1930, C. Birdseye (to Frosted Foods Co., Inc.), Packaging Fruit Juices. - A mold-supported bag of moisture-proof flexible material such as cellophane is filled with fresh orange juice or other fruit juice, the juice is frozen while so enclosed, the bag with its solid frozen contents is removed from the mold, and the bag is sealed upon the frozen juice.

C. A. 24,5085 (1930).

(1849) U. S. 1,777,094, Sept. 30, 1930, R. E. Kolbe, Apparatus for Freezing Materials. - Claim 1. In an apparatus for freezing materials, a liquid-tight compartment provided with a plurality of shelves; air-trapping receptacles supported on said shelves; and means for circulating a freezing medium in said compartment in contact with said receptacles.

Off. Gaz. 398, 840 (1930).

(1850) U. S. 1,783,864, Dec. 2, 1930, C. W. Vogt (to Vogt Instant Freezers, Inc.), Apparatus and Process for Treating Materials. - Claim 21. The method of refrigerating a material to effect rapid crystallization of at least a portion thereof which includes causing the material to flow in a comparatively thin confined layer over a heat transfer surface, subjecting said surface to the action of a refrigerating medium and rapidly and mechanically agitating the material during such flow.

Off. Gaz. 401, 212 (1930).

(1851) U. S. 1,783,867, Dec. 2, 1930, C. W. Vogt (to Vogt Instant Freezers, Inc.), Machine for Processing Materials. - Claim 1. A machine for processing materials, including a processing chamber, means for positively forcing the material to be processed therethrough, a by-pass for relieving said means of excess material, a valve in said by-pass, agitating means in said chamber, and means controlled by the resistance to the agitation of the material in the chamber due to its plasticity for controlling said valve.

Off. Gaz. 401, 213 (1930).

(1852) U. S. 1,787,681, Jan. 6, 1931, W. J. Hendren (to Booth Fisheries Company), Refrigerating Apparatus. - Claim 1. Apparatus of the class described comprising a refrigerating room having means of refrigeration therein; an overhead track leading into and out of said room; a carrier suspended from and traveling on said track; a plurality of supporting shelves on said carrier; and shiftable covers for said shelves.

Off. Gaz. 402, 115 (1931).

(1853) U. S. 1,795,330, Mar. 10, 1931, A. H. Cooke (to Atlantic Coast Fisheries Co.), Apparatus for Freezing Foods Such as Fish. - Heat-conducting elements depending upon an endless-belt carrier serve as heat-transfer means between the cooling agent and the articles to be frozen. Various structural details are described.

C. A. 25, 2494 (1931).

(1854) U. S. 1,797,606, Mar. 24, 1931, J. N. Crider, Method of Preserving Fowl. - Claim 1. Process of preserving fowl comprising: (a) dressing and drawing the fowl, (b) filling the cavity in the fowl with water and (c) freezing a block of ice in the cavity.

T. V. A., 99-194, p. 5.

(1855) U. S. 1,802,369, Apr. 28, 1931, C. Birdseye (to Frosted Foods Company, Inc.), Refrigerating Apparatus. - Claim 1. A refrigerating apparatus comprising a heat-conductor member having a face disposed in vertical position, means for supplying a refrigerating medium to said member to chill said face, and an oppositely disposed presser member arranged to hold a product to be refrigerated in intimate contact with said vertical face.

Off. Gaz. 405, 906 (1931).

(1856) U. S. 1,810,989, June 23, 1931, O. Smiley, Retarding Evaporation of Solidified Carbon Dioxide. - A "dividing element" such as hair, glass wool, wood fiber, ash or wax is commingled with the solidified material.

C. A. 25, 4951 (1931).

(1857) U. S. 1,814,915, July 14, 1931, R. V. Grayson and C. M. Foster (40/100 to Polar Products, Inc.), Refrigeration System. - Claim 1. Refrigeration system comprising a continuous conduit for the closed circulation of refrigerative air, including a refrigerating unit for chilling the air, a plurality of horizontal tunnels arranged in parallel in said system with their ends communicating with vertical limbs of said system, and a blower for forcing refrigerated air through said tunnels.

Off. Gaz. 408, 557 (1931).

(1858) U. S. 1,817,890, Aug. 4, 1931, C. Birdseye (to Frosted Foods Co., Inc.), Refrigerating Apparatus and Method of Refrigerating Food Products. - Claim 1. A refrigerating apparatus having means for maintaining a spray of liquid cooling medium together with: (a) means for conveying matter in containers within the range of the spray, said means providing a shield above said containers, both of said shields being of greater size than said containers for preventing access of the spray directly to said containers.

T. V. A., 99-198-CR, p. 3.

(1859) U. S. 1,822,077, Sept. 8, 1931, C. Birdseye (to Frosted Foods Company, Inc.), Refrigerating Apparatus. - Claim 1. A refrigerating apparatus comprising separate feeding means for presenting different articles to be refrigerated in different refrigerated zones, and a closed continuously operating system of circulation for delivering liquid cooling medium to all of said refrigerated zones.

Off. Gaz. 410, 374 (1931).

(1860) U. S. 1,822,089, Sept. 8, 1931, B. Hall (to Frosted Foods Company, Inc.), Refrigerating Apparatus. - Claim 1. A refrigerating apparatus comprising a stationary heat-conductive plate, and members disposed on either side of the stationary plate and movable toward the latter to position articles to be refrigerated against its opposite faces.

Off. Gaz. 410, 377 (1931).

(1861) U. S. 1,822,121, Sept. 8, 1931, J. J. Barry (to Frosted Foods Company, Inc.), Refrigerating Apparatus. - Claim 1. Apparatus for freezing food products, comprising a stationary hollow heat conductive plate for supporting the product to be frozen, brine circulating connections for said plate, a cooperating hollow heat conductive plate movably mounted above and in vertical alignment with said first plate, a brine circulating system operatively connected to said second plate in all positions thereof, means for moving said second plate vertically with relation to said first plate to accommodate and compress between said plates products of varied thicknesses, and means, such as counterweights connected to said plate at symmetrically disposed points, for regulating the pressure exerted by said second plate on the product engaged between the two plates.

Off. Gaz. 410, 383 (1931).

(1862) U. S. 1,822,123, Sept. 8, 1931, C. Birdseye and B. Hall (to Frosted Foods Company, Inc.), Refrigerating Apparatus. - Claim 1. A refrigerating apparatus comprising a stationary heat-conductive plate, a similar plate disposed in opposition thereto, means for moving said latter plate toward or from the stationary plate, a series of spaced interposed plates all suspended from said movable plate and movable simultaneously therewith to engage interposed products by gravity, and means for supplying cooling medium to said plates.

Off. Gaz. 410, 384 (1931).

(1863) U. S. 1,822,124, Sept. 8, 1931, C. Birdseye (to Frosted Foods Company, Inc.), Refrigerating Apparatus. - Claim 1. In a refrigerating apparatus, a conveyor band, means for distributing a temperature-regulating fluid on said band and tabs connected to said band for directing said fluid away from the central portion thereof.

Off. Gaz. 410, 384 (1931).

(1864) U. S. 1,825,643, Sept. 29, 1931, J. W. Martin, Jr. (to Dryice Equipment Corp.), Refrigerating Apparatus and Method. - Claim 7. Method of refrigeration which includes: (a) superfreezing material to be refrigerated, (b) enclosing portions of said material in a multiplicity of similar insulating boxes, and (c) stacking said containers within a refrigerating chamber along with similar containers each having frozen carbon dioxide therein, all of said carbon dioxide containers being distributed in direct heat transfer relation to the topmost layer of said containers of the material to be refrigerated.

T. V. A., 99-192-CR, p. 6.

(1865) U. S. 1,828,718, Sept. 8, 1931, M. P. Vucassovich, Freezing Apparatus. - Claim 1. In freezing apparatus comprising a horizontal container having a cover and internally partitioned to form an elongated runway, including major portions located side by side, and connecting neck portions, said runway having a loading end and a discharge end, and adapted to conduct from end to end a moving refrigerating liquid and buoyant receptacles floating therein, and means for maintaining the moving liquid at a predetermined level; a longitudinally extending track located in the runway above the bottom thereof and below the predetermined liquid level, in position to support a non-floating receptacle, in the path of a floating receptacle so that a nonfloating receptacle may be propelled to the discharge end by a following floating receptacle.

Off. Gaz. 410, 504 (1931).

(1866) U. S. 1,835,881, Dec. 8, 1931, R. E. Kolbe, Method of and Apparatus for Freezing Materials. - Claim 1. The method of freezing materials which consists in placing them in pans having covers the side walls of which are spaced from the side walls of said pans, positively retaining the bottoms only of said pans submerged in a liquid medium while moved through said medium, and preventing contact of said medium with said materials.

Off. Gaz. 413, 530 (1931).

(1867) U. S. 1,836,097, Dec. 15, 1931, A. C. Walworth, Method and Apparatus for Freezing Fish. - Claim 1. In an apparatus for freezing fish and similar foodstuffs, a freezing unit comprising a trough containing a cooling fluid, a heat exchange element in said trough having a heat conducting surface, a heat conducting receptacle movable on and in direct contact with said surface, and means for moving said receptacle on said surface.

Off. Gaz. 413, 638 (1931).

(1868) U. S. 1,847,956, Mar. 1, 1932, A. Giger, Method of Sharp Freezing Foodstuffs and Means Thereof. - Claim 1. A method of sharp freezing which consists of placing a commodity in a covered container and passing it through a body of flowing brine in which the direction of the brine is counter to the movement of the pan and of subjecting the cover to a brine spray during said passage.

Off. Gaz. 416, 253 (1932).

(1869) U. S. 1,850,031, Mar. 15, 1932, A. Rayson (to Anglo-Australian Defreezing Co. Prop., Ltd. (Australia)), Method of and Means for Defreezing Frozen Beef, Mutton, Lamb, and the Like. - Claim 6. Method of defreezing frozen products, comprising: (a) drawing in air from a chamber in which the treatment is in operation, (b) passing the air to the product, (c) discharging the said air against the product, and (d) during the transference of said air admitting either warm or cold air to the chamber as the circumstances demand.

T. V. A., 99-194, p. 5.

(1870) U. S. 1,852,095, Apr. 5, 1932, M. P. Vucassovich, Freezing Apparatus. - Claim 1. A freezer as an element of freezing apparatus, comprising a buoyant metallic receptacle adapted to float in refrigerating liquid and to contain the material to be frozen, having a bottom, a rising curb at the boundaries of said bottom, a cover overlapping said curb to deflect falling liquid from the interior of the receptacle, and a metallic inner cover of high heat conductivity spaced from said bottom and in heat conducting contact with said curb, adapted to transfer heat to the surrounding liquid from the upper side of a mass of material confined between said inner cover and bottom.

Off. Gaz. 417, 80-81 (1932).

(1871) U. S. 1,852,228, Apr. 5, 1932, C. Birdseye, (to Frosted Foods Company, Inc.), Consumer Package. - Claim 1. A consumer package of a perishable food product, comprising an open-top carton packed full of a fresh food product, a loose transparent sheet bearing an identifying mark laid upon the product, and a sealed transparent wrapper enclosing the entire package and forming with the loose sheet a double cover through which the product is visible, the packed carton and its contents being frozen into a solid block.

Off. Gaz. 417, 107 (1932).

(1872) U. S. 1,855,467, Apr. 26, 1932, J. J. Barry (to Maritime Fish Corporation Limited), Apparatus for Freezing Foodstuffs. - Apparatus for freezing foodstuffs comprising upper and lower expansion chambers adapted to receive the foodstuff therebetween, a compressor, a condenser having its inlet connected to the discharge side of the compressor and having its outlet connected to said chambers, a pre-cooling chamber surrounding a portion of the last mentioned connection, said chamber having an inlet connected to the expansion chambers and an outlet connected to the suction side of the compressor and means for moving the upper chambers relative to the lower chambers.

Off. Gaz. 417, 963 (1932).

(1873) U. S. 1,863,222, June 14, 1932, F. E. Hoermann ($\frac{1}{4}$ each to H. M. Robertson and J. M. Santo), Destroying Microorganisms in Food by High-Frequency Oscillations. - Apparatus is described; oscillations of a frequency of between 60 million and 600 million per second may be used for treating milk, beer, fruit juices, cheese, oils, or other materials.

C. A. 26, 4110 (1932)

(1874) U. S. 1,864,284, June 21, 1932, H. F. Taylor (to Atlantic Coast Fisheries Co.), Steak and Method of Producing Same. - Claim 1. Method of producing steaks, which comprises: (a) forming a predetermined shaped mass of meat, (b) spirally wrapping said mass, (c) cutting said wrapped mass transversely thereof and (d) freezing the severed portions.

T. V. A., 99-195, p. 5.

(1875) U. S. 1,864,285, June 21, 1932, H. F. Taylor (to Atlantic Coast Fisheries Co.), Steak and Method of Producing Same. - Claim 5. Method of producing frozen steaks which comprises: (a) forming a predetermined shaped mass of a plurality of pieces of meat, (b) wrapping the peripheral surface of said mass, (c) freezing the wrapped mass, and (d) cutting the frozen wrapped mass into portions of desired size.

T. V. A., 99-195, p. 5.

(1876) U. S. 1,867,546, July 19, 1932, A. H. Baer (to Frick Company), Quick Freeze Tunnel. - Claim 1. A refrigerating tunnel comprising walls of insulating material, trucks movable through said tunnel, said trucks having means thereon for preventing air passing around the sides of the trucks and to cause it to pass only through predetermined channels across the trucks, said means comprising wings resiliently mounted in the frame of the truck and to be pressed against the inner walls of the tunnel, substantially as set forth.

Off. Gaz. 420, 620 (1932).

(1877) U. S. 1,873,130, Aug. 23, 1932, C. L. Jones and J. D. Small (to Dryice Equipment Corporation), Contact Freezing Apparatus and Method. - Claim 1. A freezing apparatus comprising: (a) upper and lower frozen surfaces contacting with a refrigerant and product to be frozen, said upper surface being vertically movable and revolvable and said lower surface being revolvable.

T. V. A., 99-192-CR, p. 7.

(1878) U. S. 1,877,587, Sept. 13, 1932, R. A. Rasche, Method of Preparing Apples for Freezing. - Claim 1. In the cold processing of fresh apples for cold storage the steps of placing apple pieces in a brine solution and placing them under a vacuum, then relieving the vacuum and placing them under atmospheric air pressure, then sugaring the fruit and placing it in cold storage at a temperature well below freezing.

Off. Gaz. 422, 568 (1932).

(1879) U. S. 1,880,232, Oct. 4, 1932, C. Birdseye (to Frosted Foods Company, Inc.), Refrigerating Apparatus. - Claim 1. Refrigerating apparatus including an inclined runway for holding a series of circular containers arranged in contact with each other, power operated means for controlling the rate of movement of said containers along the runway, said means being arranged to engage the containers while resting on and traveling along the runway, and means for flowing liquid cooling medium over the containers.

Off. Gaz. 423, 50 (1932).

(1880) U. S. 1,881,171, Oct. 4, 1932, E. H. Cooley, Method of Preparing Fish and Other Meats. - Claim 3. Process of producing cake of fragments of soft meat by: (a) forming column of fragments, (b) continuously supplying material to original end of column, (c) moving column along rectangular path by continually applying pressure axially to end of column, (d) freezing fragments into hard mass during movement, (e) severing from other end of column section of desired thickness.

T. V. A., 99-194-CR, p. 3.

(1881) U. S. 1,882,969, Oct. 18, 1932, P. A. Scherer and G. B. Ridley (to Southern Oregon Sales Inc.), Refrigerating System and Method. - Claim 2. In a system of the character described, a refrigeration space containing a medium to be cooled, brine recirculating means adapted to bring cool brine into heat absorbing contact with said medium, means for diverting a portion of said brine from said recirculating means and for returning the same to said means, means for heating of said diverted brine portion out of contact with the atmosphere and means for subjecting the diverted portion to the atmosphere to evaporate undesired moisture prior to its return to said recirculating means.

Off. Gaz. 423, 745 (1932).

(1882) U. S. 1,884,429, Oct. 25, 1932, D. K. Warner, Freezing Foods. - Fruits or other foods are quickly frozen (in apparatus which is desired) in a high vacuum by partial evaporation of the liquid in the food or of water mixed with or intermittently sprayed over the food.

C. A. 27, 1061 (1933).

(1883) U. S. 1,887,127, Nov. 8, 1932, B. Hall (to Frosted Foods Company, Inc.), Refrigerating Apparatus. - Claim 1. Refrigerating apparatus comprising heat-conductive members relatively movable to engage between them a product to be chilled and then movable with the product to carry the same through an endless path, whereby the product may be delivered to and removed from the heat-conductive members in substantially the same location.

Off. Gaz. 424, 537 (1932).

(1884) U. S. 1,892,224, Dec. 27, 1932, D. G. Sorber, Apparatus for Freezing Canned Goods. - Claim 1. Apparatus for freezing canned goods comprising: (a) expansion chamber, (b) means for supplying refrigerant to chamber, (c) settling chamber to receive refrigerant after expansion with absorbtion coils therein, (d) insulated chamber surrounding settling chamber with refrigerant bath therein, (e) fixed helically directed track within insulated chamber defining can-path down which the can may roll by gravity through the bath, and (f) means for circulating refrigerant of bath from insulated chamber thru absorption coils and back to insulated chamber.

T. V. A., 99-192-CR, p. 8.

(1885) U. S. 1,894,813, Jan. 17, 1933, M. T. Zarotschenzeff (to American "Z" Corporation), Means and Method for Chilling and Freezing Foodstuffs. - Claim 4. Method for refrigerating edible products, which consists in: (a) subjecting the edible products in a chamber to the action of chilled air and also of a dense fog comprising (1) a medium of low temperature, and, (b) withdrawing from the air and dense fog in the chamber of heat absorbed from the edible products as they are being frozen.

T. V. A., 99-192-CR, p. 8.

(1886) U. S. 1,896,529, Feb. 7, 1933, D. K. Tressler and K. B. Norton (to Frosted Foods Co. Inc.), Liquid Food Product and Method of Packaging the Same. - Claim 1. Process of preparing liquid or semi-liquid food products consisting in: (a) forming the fresh product into a frozen cake having an exterior surface consisting entirely of the said product, (b) protecting it by completely enclosing the frozen cake in an aqueous glaze directly engaging the said surface.

T. V. A., 99-192, p. 6.

(1887) U. S. 1,905,131, Apr. 25, 1933, C. Birdseye and B. Hall (to Frosted Foods Company, Inc.), Refrigerating Apparatus. - Claim 1. A refrigerating apparatus comprising a series of substantially horizontal heat-conductive plates movably disposed in substantially vertical alignment and adapted to receive thereon and therebetween products to be frozen, means for so connecting said plates as to maintain them equally spaced from each other, means for simultaneously varying the spacing thereof, and means for supplying cooling medium to the plates.

Off. Gaz. 429, 585 (1933).

(1888) U. S. 1,905,602, Apr. 25, 1933, F. H. Patterson, Quick Freezing of Products Such as Meats. - Articles such as meat are packed in containers with comminuted material such as aluminum or copper which will not cohere when subjected to quick-freezing temperatures (the container being formed of material such as aluminum or copper having a high coefficient of thermal conductivity) and the container and contents are then cooled by contact with a freezing medium.

C. A. 27, 3540 (1933).

(1889) U. S. 1,907,404, May 2, 1933, J. H. Grande, Shipping Crate. - Claim 1. Refrigerator shipping crate having: (a) external walls, (b) partitions extending substantially parallel between such walls and spaced apart by layers of food commodities, and (c) an end refrigerant chamber wholly external to the storage space within the wall.

T. V. A., 99-193-CR, p. 3.

(1890) U. S. 1.907,649, May 9, 1933, C. Marx (to P. W. Petersen), Quick Freezing of Foods Such as Meats, etc. - The products are wrapped in with suitable paper or other suitable material and then cooled by a liquid metallic bath such as mercury which does not wet the wrapped products. Apparatus is described.

C. A. 27, 3540 (1933).

(1891) U. S. 1,912,896, June 6, 1933, P. W. Hiller, Art of Refrigerating Fish at Sea. - Claim 1. Process of preserving fish at sea comprising: (a) immersing fish into tank of freezing sea water soon after they are caught, (b) discharging the sea water from said tank, (c) using the discharged sea water to partially cool a charge of fresh sea water.

T. V. A., 1937 Report, p. 8.

(1892) U. S. 1,915,634, June 27, 1933, C. W. Vogt (to Vogt Instant Freezers Inc.), Preparing and Extruding Materials Such as Frozen Foods. - Various details of apparatus and operation are described. Claim 1. The process of treating material including processing a batch of said material in a processing chamber to increase its stiffness to a point at which it does not readily flow by gravity or by gravity assisted by mechanical agitation, and thereafter extruding the same from said chamber under pressure greater than atmospheric pressure.

C. A. 27, 4321 (1933).
Off. Gaz. 431, 898 (1933).

(1893) U. S. 1,917,048, July 4, 1933, T. Midgley, Jr., (to Frigidaire Corporation), Telltale Means. - Claim 1. A frozen food package comprising: (a) a container, (b) a wrapper of transparent material enclosing at least a portion of said container, (c) a visible character formed of frozen material located between said transparent material and said container, said frozen material being adapted to melt and to permanently change in form when the temperature of the package rises to the temperature below which it is desired to maintain the frozen food.

T. V. A., 99-192, p. 6.

(1894) U. S. 1,920,184, Aug. 1, 1933, A. B. Brackett (to Frosted Foods Company, Inc.), Carton for Frozen Food Products. - Claim 3. Carton for frozen food products comprising: (a) box like body having a bottom panel, (b) connected side panels and end portions extending outwardly beyond said panels, (c) a cover integrally attached to the free edge of one of the side panels and having end portions at its end, the line of attachment of the cover and side panels extending slightly beyond the ends of the side and cover panels.

T. V. A., 99-193-CR, p. 3.

(1895) U. S. 1,920,222, Aug. 1, 1933, H. F. Taylor (to Atlantic Coast Fisheries Co.), Preserving Fish etc. for Food. - Material such as the flesh of fish or meat or poultry is treated with an alkaline substance such as $NaHCO_3$ and NaCl to give a pH of approximately 7 and improve the retention of water in the material, which may be frozen. Cf. Brit. 355,322.

C. A. 27, 4858 (1933).

(1896) U. S. 1,921,055, Aug. 8, 1933, M. P. Vucassovich, Method of and Apparatus for Preparing Fish and Fillets for Storage. - Claim 1. Improve-

ment in the method of preparing a skin bearing fish or fish fillet for use consisting: (a) freezing the fillet and its skin, (b) softening the skin by heat without appreciably softening the fillet, (c) stripping the softened skin from the fillet while the latter is frozen.

T. V. A., 1937 Report, p. 34.

(1897) U. S. 1,924,903, Aug. 29, 1933, C. Birdseye (to Frosted Foods Co., Inc.), Marketable Package of Frozen Meat. - A unit of fresh, moist meat such as a leg of lamb is provided with a closely adhering wrapper of cellulosic material such as regenerated cellulose with an outer covering of material such as stockinet and frozen so as to provide an ice glaze upon the fabric covering.

C. A. 27, 5442 (1933).
T. V. A., 99-194, p. 6.

(1898) U. S. 1,924,988, Aug. 29, 1933, R. V. Grayson and E. G. Ballenger (Grayson assignor to Patent and Security Holding Corporation), Quick Freezing System. - Claim 10. Quick freezing system comprising means providing a refrigerating bath, means comprising a thawing bath, and means for transporting packages of the product to be frozen successively through said refrigerating bath and said thawing bath at a rate of speed to accomplish freezing of the product in its transit through the refrigerating bath, said transporting means including a conveyor and racks forming parts of said conveyor for suspending said packages in said baths. Claim 15. Quick freezing system comprising a conduit for a circulating freezing medium, a part of said conduit including tunnels, the adjacent outer walls of which converge downwardly forming a chamber for solid refrigerant, the walls of said tunnels having a laterally undulating contour.

Off. Gaz. 433, 1323 (1933).

(1899) U. S. 1,925,033, Aug. 29, 1933, W. J. Finnegan, Method and Apparatus for Rapid Freezing and Handling of Comestibles. - Claim 1. Apparatus for refrigerating a cartridge comprising a guide tube for the reception of the cartridge, means for flowing a heat-transfer vehicle over the adjacent walls of the cartridge and guide tube. Claim 13. The method of freezing comestibles and the like consisting of flowing a heat transfer vehicle through a restricted area and completely enveloped by the heat transfer vehicle, and simultaneously flowing a refrigerant medium in close relation to the heat transfer vehicle.

Off. Gaz. 433, 1334 (1933).

(1900) U. S. 1,931,347, Oct. 17, 1933, N. H. Gay, Apparatus for Preparing Potable Water. - Claim 1. In a water purifying plant, means for compressing gaseous refrigerant, two condensers for receiving the compressed gaseous refrigerant and liquefying the same, an evaporator connected to one of said condensers and providing a chilling surface, means for passing impure water over said chilling surface whereby to form pure ice from the same and to discharge therefrom water containing a higher proportion of impurity, means for employing the ice thus formed for cooling one said condenser, independent means for cooling the other said condenser, and devices for controlling the flow of gaseous refrigerant from said compressing means to said condensers.

Off. Gaz. 435, 741-42 (1933).

(1901) U. S. 1,931,623, Oct. 24, 1933, D. Robertson, Apparatus for Treating Foodstuffs. - Claim 1. An apparatus for subjecting foodstuffs to a circulating fluid, a chamber having a substantially complete vertical side movable on supports in a direction at right angles to its surface and having a holder or carrier for supporting a load of foodstuffs to be treated attached to its inner surface, said vertical side closing the chamber in a liquid-tight manner, and means to circulate a fluid through said chamber.
Off. Gaz. 435, 860 (1933).

(1902) U. S. 1,932,431, Oct. 31, 1933, L. B. Winton (to American Sealcone Corporation), Apparatus for Freezing Liquid or Semiliquid Substances in Receptacles. - Claim 1. In apparatus for freezing the contents sealed in receptacles, a tank containing a freezing substance, a cabinet arranged to support and enclose the tanks, and an endless conveyor having means to releasably engage and suspend sealed receptacles, and means mounted in the cabinet to guide a stretch of the conveyor to travel in different planes to progressively engage the receptacles suspended from said conveyor stretch into and through the freezing substance in the tank to freeze the contents of the receptacles progressively upwardly from the bottom and inwardly from the sides of the receptacles and move the receptacles out of the tank.
Off. Gaz. 435, 1090 (1933)

(1903) U. S. 1,932,887, Oct. 31, 1933, A. Giger, Sharp Freezing Device and Process. - Claim 1. A sharp freezing device comprising a hollow body adapted to contain a refrigerant, said body having an open ended passage forming a freezing zone extending therethrough, a plurality of conveyor belts extending through and beyond said passage in substantial contact with two of its walls, said conveyor belts being so disposed in relation to each other as to form a channel for the reception of food products for conveyance through the freezing zone.
Off. Gaz. 435, 1186 (1933).

(1904) U. S. 1,933,257, Oct. 31, 1933, J. C. Goosmann (to American Dryice Corporation), Method and Apparatus for Speed Freezing. - Claim 2. In an apparatus of the type described, the combination comprising means forming a chamber, a conveyor within said chamber, a source of liquid carbon dioxide, means for spraying liquid carbon dioxide from the source into the chamber, and a discharge connection for the chamber including a pressure control valve for maintaining a predetermined pressure within the chamber.
Off. Gaz. 435, 1269 (1933).

(1905) U. S. 1,936,074, Nov. 21, 1933, D. K. Tressler and W. T. Murray (to Frosted Foods Co., Inc.), Conserving the Moisture Content of Meat Food Products. - The surface portion of products such as beef or fish fillets is subjected for a short time to the action of a proteolytic enzyme such as trypsin.
C. A. 28, 839 (1934).

(1906) U. S. 1,936,814, Nov. 28, 1933, W. Wetta, Sr. (to Kroger Grocery and Baking Company), Collapsible Freezer Box for Meats. - Claim 3. Collapsible meat molding container comprising: (a) a bottom elevated on flanges, (b) sides and ends hinged thereto, (c) a securing member adapted to fit around and hold said sides and ends in assembled position, (d) a presser

board adapted to fit into said container, (e) a means projecting thru perforations in said sides and securing member to hold said board in said container.

T. V. A., 99-194-CR, p. 4.

(1907) U. S. 1,938,522, Dec. 5, 1933, R. V. Grayson ($\frac{1}{2}$ to E. G. Ballenger, C. M. Foster, and F. M. Bird, organizers of Refrigeration Patents and Processes, Inc.), Deaerating Freezing Process and Apparatus Therefor. - Claim 1. De-aeration freezing system for liquids comprising a reservoir, a freezer and a discharge tank in valved, serial communication in the order named, said discharge tank having a valve controlled atmospheric outlet, means for maintaining a vacuum in said freezer and discharge tank during the freezing period, means for admitting an oxygenless gas to said discharge tank, up to atmospheric pressure, to permit gravital discharge of its contents, and means for holding the vacuum in said freezer during the discharge period of said discharge tank.

Off. Gaz. 437, 282 (1933).

(1908) U. S. 1,939,109, Dec. 12, 1933, C. M. Davidson (to Pan American Frozen Products, Inc.), Apparatus (Employing Glycerol as a Refrigerant) for Quick Freezing of Food Products such as Fruits and Fruit Juices. - Various structural, mechanical, and operative details are described. These comprise, in combination, (a) a reservoir, (b) glycerin therein utilized as a refrigerant and a lubricant, (c) permanent containers engaging said lubricant and (d) means in the reservoir for supporting the containers as they are moved adapted to be lubricated by the glycerin while the contents of the containers are refrigerated by the glycerin.

C. A. 28, 1423 (1934).
T. V. A., 99-198-CR, p. 4.

(1909) U. S. 1,940,192, Dec. 19, 1933, D. G. Sorber, Apparatus for Freezing Canned Goods. - Claim 1. In apparatus for freezing canned goods, an insulated casing consisting of: (a) deep refrigerating bath with can inlet and outlet above level of bath, (b) can path within casing completely below level of bath and composed of annular series of pockets and fixed helically directed rail concentric with and lying outside of series, (c) means for imparting axial rotation to annular pockets to effect advance of cans thru path and below level of bath, (d) means to feed cans thru can inlet to can path, (e) means to discharge cans from can path thru can outlet after passing thru path.

T. V. A., 99-192-CR, p. 9.

(1910) U. S. 1,940,164, Dec. 19, 1933, W. T. Comer (to Crystal Carbonic Laboratory), Apparatus for and Process of Freezing Comestibles. - Claim 1. An apparatus for freezing material combrising: (a) a closed freezing chamber having an opening, (b) conveying means for passing material to be frozen into and out of said chamber, thru said opening, (c) means to enclose a refrigerating space in direct heat exchanging relationship with a wall of said chamber, (d) means to form and continuously renew a supply of carbon dioxide snow in said space to free material carried into and out of said chamber by the conveying means.

T. V. A., 99-192-CR, p. 9.

(1911) U. S. 1,940,192, Dec. 19, 1933, D. G. Sorber, Apparatus for Freezing Canned Goods. - Claim 1. In apparatus for freezing canned goods, an insulated casing consisting of: (a) deep refrigerating bath with can inlet and outlet above level of bath, (b) can path within casing completely below level of bath and composed of annular series of pockets and fixed helically directed rail concentric with and lying outside of series, (c) means for imparting axial rotation to annular pockets to effect advance of cans thru path and below level of bath, (d) means to feed cans thru can inlet to can path, (e) means to discharge cans from can path thru can outlet after passing thru path.

T. V. A., 99-192-CR, p. 9.

(1912) U. S. 1,940,337, Dec. 19, 1933, S. Triplett and J. B. Beard, Method of Preserving Perishable Food Products. - Claim 1. Process of preserving fruits and like perishable food products consisting: (a) treating such products to cause the juice thereof to be exuded therefrom, (b) retaining such juices in surrounding and covering relation to the products, (c) freezing the juices.

T. V. A., 99-193, p. 5.

(1913) U. S. 1,940,353, Dec. 19, 1933, J. C. Jenkins, Liquefying Frozen Products such as Frozen Fruit. - The frozen material is simultaneously comminuted and subjected to the action of heat to assist liquefaction and then immediately removed from the heat zone (to avoid materially raising the temperature). Apparatus is described.

C. A. 28, 1423 (1934).

(1914) U. S. 1,940,773, Dec. 26, 1933, O. S. Sells, Whole Grain Corn and Method of Canning the Same. - Claim 5. The method of canning whole grain green corn comprising the steps of heating the ears for a controlled time and temperature short of cooking but sufficient to coagulate the kernel contents, then cooling the ears sufficiently to fix the entire coagulated contents of the kernels, then cutting the kernels substantially whole from the cobs, filling into containers, exhausting the containers, sealing permanent covers on the containers and sterilizing the closed containers.

Off. Gaz. 437, 937 (1933).

(1915) U. S. 1,942,307, Jan. 2, 1934, J. Reeh (to Societe Anonyme de Conservation Industrielle du Poisson), Refrigerator. - Claim 1. A refrigerator more particularly for fish, in which a drum is divided into longitudinal compartments and is mounted for rotation on a fixed hollow shaft which is perforated at its lower part, in order to distribute refrigerating liquid, a cylindrical bucket surrounding and co-axial with the drum and apertured below the hollow shaft at such a height that the liquid contained in the bucket and in the interior of the drum cannot reach the hollow shaft.

Off. Gaz. 438, 244 (1934)

(1916) U. S. 1,943,019, Jan. 9, 1934, G. R. Henney and C. T. Walter (to Swift and Company), Preparation of Frozen Meat and the Like. - Claim 1. Process of producing a comminuted flesh food product consisting in: (a) subjecting the product to temperatures below freezing until the product is reduced to a semi-frozen condition (b) comminuting while in such semi-frozen condition, (c) pressing a collection of the resulting comminuted semi-frozen products to a desired form.

T. V. A., 99-194, P. 7.

(1917) U. S. 1,944,857, Jan. 23, 1934, H. V. Atwell (to Standard Oil Co. of Ind.), Apparatus for Quick Freezing of Foods such as Fruits, Vegetables and Meats. - Various structural and operative details are described suitable for use with refrigerant such as propane under such pressure that it boils at -20° to -35° C. Claim 1. In apparatus for freezing food, a closed system comprising a container for a liquid refrigerant, means for regulating the pressure in said container whereby the refrigerant boils at about -20° to -35° C., and sealed gates for passing food into and out of said container, whereby the pressure in the container is not materially altered by the introduction of food therein or the removal of food therefrom.

C. A. 28, 2076 (1934).
Off. Gaz. 438, 979 (1934).

(1918) U. S. 1,947,082, Feb. 13, 1934, A. B. Haslacher, Refrigeration Mechanism. - Claim 1. A refrigeration mechanism comprising a frame, means for suspending said frame, a pair of plates mounted on said frame, a collar clamped between said plates, and a container mounted on said collar.

Off. Gas. 439, 459 (1934).

(1919) U. S. 1,947,083, Feb. 13, 1934, A. B. Haslacher, Container. - Claim 1. The combination with a cylindrical container of a perforated plate axially movable in said container and having an upturned edge forming a substantially continuous flange frictionally engaging the wall of said cylindrical container to hold said plate in any axial position, and a separate cover engaging one end of said container and limiting the axial movement of said plate in one direction.

Off. Gaz. 439, 459 (1934).

(1920) U. S. 1,948,790, Feb. 27, 1934, R. V. Grayson (½ to E. G. Ballenger, C. M. Foster, and F. M. Bird, as organizers and incorporators of Refrigeration Patents and Processes, Inc.), Refrigeration System. - Claim 1. Refrigeration system comprising, means defining a conduit for the re-current circulation of refrigerated air, said means including a tunnel, and an endless conveyor for the product to be frozen, having a portion thereof travelling longitudinally within said tunnel, of such length and travelling at such speed as to effect the requisite freezing during the sojourn of said product within said tunnel, said conveyor including means cooperating with a wall of said tunnel for repeatedly overturning the product to be frozen during its progress within said tunnel.

Off. Gaz. 439, 957 (1934).

(1921) U. S. 1,950,763, Mar. 13, 1934, C. T. Walter (to Swift and Company), Method of Packing Meat. - Claim 1. Process of producing a meat product consisting in: (a) mechanically molding the comminuted meat product, (b) freezing while in such molds sufficiently to permit removal of the product from the mold without appreciably altering its form, (c) wrapping for the trade, (d) freezing solid.

T. V. A., 99-194, p. 7.

(1922) U. S. 1,952,666, Mar. 27, 1934, B. S. Foss (to B. F. Sturdevant Co.), Freezing Foods or the Like such as Fish, Fruit Juices, etc. - The material is subjected to the direct action of a gas such as air at a temperature not substantially above -40° C. and at a velocity not less than

about 1000 feet per minute, in order to effect quick freezing without desiccation or undesirable loss of moisture.

C. A. 28, 3496 (1934).

(1923) U. S. 1,953,521, Apr. 3, 1934, C. W. Vogt (to Vogt Instant Freezers, Inc.), Process and Apparatus for Hardening Material. - Claim 1. A freezing apparatus, including means for advancing material along a predetermined path, and a series of separate refrigerant containers arranged along said path and having heat conducting walls acting in succession on the material to abstract heat therefrom.

Off. Gaz. 441, 148 (1934).

(1924) U. S. 1,955,484, Apr. 17, 1934, C. Birdseye (to Frosted Foods Co.), Preparing Spinach in Packages for Marketing. - Raw spinach is partially cooked to remove a portion of its moisture content, render it pliable and compact, and break down its cellular structure; a carton is then completely filled with the material, closed, sealed, and subjected to a quick-freezing from opposite sides of the carton, which further breaks down the cellular structure of the spinach.

C. A. 28, 3808 (1934).

(1925) U. S. 1,961,069, May 29, 1934, E. J. Murphy, Freezing Apparatus. - Claim 1. In a freezing apparatus, a pan, a refrigerating coil disposed in said pan and composed of a tubular conductor carrying a refrigerant, the sections of said coil having flat top faces all disposed in a common plane with the adjacent edges of the sections in close proximity to each other, and a loose refrigerant in the pan in contact with the sections of the coil below the flat top faces.

Off. Gaz. 442, 1292 (1934).

(1926) U. S. 1,961,070, May 29, 1934, E. J. Murphy, Freezing Apparatus. - In freezing apparatus, a cabinet, a plurality of vertically spaced, horizontal coils in said cabinet and plates adjacent said coils and arranged in staggered relation to provide a sinuous path for air, and snap clamping means for securing said plates to said coils.

Off. Gaz. 442, 1292 (1934).

(1927) U. S. 1,961,337, June 5, 1934, R. L. Cornell, Vegetable-Conditioning Method and Machine. - Claim 1. Method of washing and cooling food materials by: (a) causing food material to float countercurrently in flowing body of cool H_2O while in contact with H_2O while part of food materials protrude above H_2O, causing precooled H_2O to shower protruding parts of food material and to pass thence down into flowing-body for adding thereto and causing it to continue to flow, (b) trapping part of H_2O that has washed and cooled food material, (c) elevating and recooling part of trapped water, (d) re-showering food mat. with recooled H_2O while food materials remain in said body of cool water.

T. V. A., 99-193-CR, p. 4.

(1928) U. S. 1,963,965, June 26, 1934, H. R. Beard, Preservation of Foods. - Claim 1. In the preservation of foods the process of freezing comprising: (a) subjecting articles to the action of a high speed current of a refrig-

erated gaseous medium at freezing temperatures and having a rate of flow amongst said articles of between approximately 400 and 3000 feet per minute. T. V. A., 1937 Report, p. 16.

(1929) U. S. 1,965,617, July 10, 1934, C. W. Vogt (to Vogt Processes, Inc.) Process and Apparatus for Processing Materials. - Claim 1. Process of refrigerating a material to effect crystalization of at least a portion thereof comprising: (a) causing the material to flow in a comparatively thin confined layer, (b) subjecting it to the action of a temperature changing medium while in said layer, (c) mechanically agitating the material in said layer, (d) advancing the material thru a second comparatively thin confined layer but in a substantially quiescent state.
T. V. A., 99-192-CR, p. 10.

(1930) U. S. 1,965,624, July 10, 1934, J. M. Young (to American Can Co.), Method of Freezing Food Products. - Claim 1. Process of freezing food in fibre container by: (a) inserting fitting narrow container into metallic vessel, (b) hermetically sealing vessel with metallic cover, (c) passing sealed vessel thru liquid refrigerating chamber on conveyor, (d) removing vessel with frozen contents from conveyor after passing through chamber.
T. V. A., 99-192-CR, p. 11.

(1931) U. S. 1,968,543, July 31, 1934, L. N. Udell, Method of and Apparatus for Refrigerating Materials. - Claim 1. A method of refrigeration, which consists in packing the goods to be refrigerated in a pan having a dished cover, pouring a liquid refrigerant into said cover and permitting the refrigerant to overflow therefrom at a fixed level whereby to maintain in said cover a body of refrigerant of constant depth and simultaneously subjecting the side and bottom walls of said pan to contact with a body of liquid refrigerant including overflow from said cover.
Off. Gaz. 444, 1151 (1934).

(1932) U. S. 1,969,124 Aug. 7, 1934, W. G. Finch (to Kold-Hold Mfg. Co.), Brine Solution for Refrigerating Purposes. - A eutetic solution for refrigerating purposes comprises $BaCl_2$ 19, KCl 18, and NaCl 4 ounces per gallon of water.
C. A. 28, 6218 (1934).

(1933) U. S. 1,969,730, Aug. 14, 1934, M. R. Daughters (to Frosted Foods Company), Process of Improving Sweet Corn for Preserving. - Claim 1. Process of preserving and packing whole grain sweet corn which has been removed from the cob consisting: (a) treating the substantially intact grains with a hot caustic solution to soften or dissolve the outer covering thereof, (b) removing excess liquid from the grains, (c) wrapping the grains so prepared to retard evaporation therefrom, (d) freezing the wrapped grains.
T. V. A., 99-193, p. 6.

(1934) U. S. 1,969,832, Aug. 14, 1934, H. A. Beard (to New England Fish Co.) Method of Freezing Fish and Other Food Stuffs. - Claim 1. In a method of freezing fish or other food stuffs those steps consisting: (a) subjecting the articles to the action of a refrigerated gaseous medium, (b) applying an air-excluding coating of ice glaze to the articles at an early stage of

the freezing process, (c) continuing the freezing by said medium, and (d) renewing said glaze periodically during the freezing period.

T. V. A., 1937 Report, p. 17.

(1935) U. S. 1,969,833, Aug. 14, 1934, H. R. Beard (to New England Fish Company), Apparatus for Treating Foodstuffs. - Claim 1. Apparatus for treating foodstuffs, including means for setting up a continuous closed circuit of a gaseous refrigerant, and a continuous foodstuff conveyor means running in a closed circuit a portion of which passes through the first-mentioned circuit, elements of said conveyor serving as seal means to prevent loss of the refrigerant.

Off. Gaz. 445, 354 (1934).

(1936) U. S. 1,970,437, Aug. 14, 1934, N. Snitkin, Rapid Freezing of Liquids such as Those of Organic Origin. - Various details of apparatus and operation are described. Claim 1. A method of freezing liquids, particularly those of an organic origin, comprising ejecting a liquid in a finely subdivided state and passing a plurality of jets of cooled air in different directions through said subdivided liquid, said liquid and said jets of cooled air forming a whirlwind motion during the last mentioned step.

C. A. 28, 6218 (1934).
Off. Gaz. 445, 489 (1934).

(1937) U. S. 1,975,009, Sept. 25, 1934, A. L. Kronquest (to Continental Can Co.), Process of Freezing Food Products in Metal Containers. - Claim 1. Process of freezing food products in sealed metal containers having on the exterior surface thereof lithograph decorations consisting: (a) applying over the exterior decorated surface of the container a transparent protective material impermeable by a fluid refrigerant, (b) immersing the protected containers in such fluid refrigerant for a period of time sufficient to freeze the food product in the container.

T. V. A., 99-198, p. 6.

(1938) U. S. 1,977,373, Oct. 16, 1934, C. Birdseye (to Frosted Foods Co.), Freezing and Packaging Food Products. -Claim 1. Process of freezing and packaging food products characterized by: (a) supporting a carton upon a plane surface, (b) reinforcing its marginal walls by enclosing the carton with an open frame, (c) packing the carton while so supported and reinforced, (d) engaging the packaged carton upon its exposed faces, (e) freezing the product therein from said faces.

T. V. A., 99-198-CR, p. 4.

(1939) U. S. 1,979,124, Oct. 30, 1934, H. L. P. Tival, Process for Preparation in Dry Powdered Form of Animal Fish and Vegetable Matter. - Claim 1. Process for preparation in dry powdered form of animal and vegetable matter comprising: (a) freezing the material to be treated to a solid condition, (b) mechanically crushing the solid frozen material to a powdered form, (c) subjecting the powdered frozen material to a pressure corresponding to melting point of ice at the prevailing temperature to express the moisture contained in the material.

T. V. A., 99-192-CR, p. 11.

(1940) U. S. 1,980,695, Nov. 13, 1934, I. H. Polk (to Sunset Packing Corporation), Art of Preserving Fresh Fruit Juices in their Natural State. - Claim 6. Process of preserving fruit juices by: (a) cooling fresh fruit to freezing point, (b) extracting juice, (c) agitating juice under vacuum of at least 27 in. mercury gauge, (d) hold juice quiescent under vacuum until pulp has collected at surface, (e) rejecting upper layer, (f) filling residual juice into containers, (g) sealing under vacuum, and (h) quick freezing juice.

T. V. A., 99-192-CR, p. 11.

(1941) U. S. 1,981,583, Nov. 20, 1934, P. H. Craig (to Invex Corp.), Preserving Food Materials by Use of X-Rays. - Food materials such as fruits and vegetables are sealed within a container such as an iron can having (suitably as an internal coating) a substance such as tin capable of emitting second radiations including soft X-rays, and the radiator material is exposed to the action of hard X-rays to produce such secondary radiation so that it will act upon the food material.

C. A. 29, 517 (1935).

(1942) U. S. 1,982,029, Nov. 27, 1934, G. Sperti, R. B. Withrow, R. J. Norris, and H. Schneider (to General Development Laboratories, Inc.), Food Irradiation with Ultra-Violet Light. - For simultaneously increasing the vitamin content and destroying bacteria, foods are irradiated with ultra-violet light while excluding from the light (by a suitable filter) those shorter wave lengths which are harmful to the taste, smell, and color of the food.

C. A. 29, 517 (1935).

(1943) U. S. 1,983,754, Dec. 11, 1934, B. Hall (to Frosted Foods Company), Refrigerating Method and Machine. - Claim 1. The method of freezing food products, which consists in moving a measured volume of the same as a unit across a refrigerating surface and in contact therewith.

Off. Gaz. 449, 360 (1934).

(1944) U. S. 1,983,768, Dec. 11, 1934, K. B. Norton (to Frosted Foods Company, Inc.), Art of Refrigeration. - Claim 1, Process of freezing food products consisting: (a) assembling the product between two heat conductive plates, (b) placing the assembly within a collapsible and water tight covering, (c) submerging the enclosed assembly in a liquid refrigerant which presses the covering into contact with the plates.

T. V. A., 99-198-CR, p. 4.

(1945) U. S. 1,987,170, Jan. 8, 1935, G. Varney, Refrigeration. - In a refrigeration apparatus, means to submerge an article and propel the same through a refrigerated fluid, means for refrigerating said fluid and separate means for refrigerating said propelling means.

Off. Gaz. 450, 393 (1935).

(1946) U. S. 1,991,733, Feb. 19, 1935, D. K. Dean and G. C. Holder (to Foster Wheeler Corporation), Method and Apparatus for Cooling Liquid. - Claim 1. Method of cooling an emulsion which comprises (a) reducing the pressure of the emulsion in a plurality of steps without substantial

evaporation, (b) vaporizing a portion of the emulsion at the reduced pressure, and (c) supplying the heat of vaporization from the unvaporized portion of the emulsion.

T. V. A., 99-192-CR, p. 12.

(1947) U. S. 1,994,233, Mar. 12, 1935, W. S. Shaw, Freezing Machine. - Claim 1. A quick-freezing machine comprising in combination, a framework, a plurality of stationary horizontally disposed hollow plates mounted rigidly thereon, a plurality of hollow movable horizontally disposed plates positioned above said stationary plates, means for raising and lowering said movable plates, connections between said lower plates for passing refrigerating fluid therethrough telescoping connections for permitting similar operation with the movable plates, said connection comprising vertically disposed pipes attached to the upper surface of said plates, and vertical pipes telescoping into the latter, said second set of pipes being interconnected by return-bends that are supported on said framework.

Off. Gaz. 452, 403 (1935).

(1948) U. S. 1,995,729, Mar. 26, 1935, M. T. Zarotschenzeff (to American "Z" Company), Preservation or Keeping and Display of Food Substances. - Claim 4. In an apparatus of the class described, a display chamber containing edible substances, a storing chamber containing edible substances, means for introducing an atomized liquid refrigerant into said display and storing chambers, a refrigerating chamber for cooling said liquid refrigerant prior to introduction into said display and storing chambers, and means for directing the liquid refrigerant after heat exchange with the edible substances into the refrigerating chamber for re-cooling.

Off. Gaz. 452, 851 (1935).

(1949) U. S. 1,996,781, Apr. 9, 1935, L. B. Winton (to American Sealcone Corporation), Method of Freezing Liquid or Semi-Liquid Substances in Containers. - Claim 10. Process of freezing liquid or semi-liquid food commodities comprising: (a) packing commodity liquid tight in conical container, (b) engaging container with commodity therein in upright position and with larger diameter end lowermost continuously into refrigerating medium below freezing point of commodity.

T. V. A., 99-198-CR, p. 5.

(1950) U. S. 1.998,179, Apr. 16, 1935, E. J. Wolf, Physiologically Balanced Salt Mixture for Use with Foods. - A solube and substantially stable mixture is formed comprising NaCl 74.5 together with K tartrate 7.5, Mg lactate 8 and Ca lactate about 10% or substances of generally similar properties.

C. A. 29, 3743 (1935).

(1951) U. S. 1,998,431, Apr. 23, 1935, C. Birdseye (to Frosted Foods Co.), Freezing Food Products such as Fruit Juices, Meats, etc. in Individual Containers. - Various features of apparatus and operation are described. Claim 6. A refrigerating machine comprising a pair of spaced heat-conductive plates, means for refrigerating the plates, and a plurality of molds movable between the plates and adjacent thereto, each mold comprising two end walls and a U-shaped member of relatively thin metal therebetween forming the cooperating side walls of the mold.

C. A. 29, 3743 (1935).
Off. Gaz. 453, 771 (1935).

(1952) U. S. 2,003,214, May 28, 1935, E. J. Murphy, Freezing Apparatus. - Claim 1. In a freezing apparatus, a cabinet, a plurality of pans arranged in said cabinet in superposed relation and spaced from each other, said pans being of a width corresponding to the width of the cabinet but of a length less than the cabinet and arranged with alternate pans in contact with the same end wall of the cabinet and succeeding pans in contact with opposite end walls to provide a sinuous path for air currents over succeeding pans, a refrigerant-containing coil disposed in each pan, a liquid heat exchange medium disposed in each pan in contact with the coil therein, and air circulating means for extracting the air from the cabinet above the topmost pan and redelivering it below the lowermost pan.

Off. Gaz. 454, 993 (1935).

(1953) U. S. 2,004,354, June. 11, 1935, J. S. Tierney, Preparing Fresh Apples for Cold Packing. - Apple pieces are immersed in a solution containing a major proportion of sugar and citric acid and a minor proportion of salt, and while so immersed are subjected to a vacuum; the vacuum is then broken, and the apple pieces are packed and frozen.

C. A. 29, 4851 (1935).

(1954) U. S. 2,007,837, July 9, 1935, A. V. Rudd and C. L. Ashley (to Rudd Engineering Company), Refrigerating Apparatus. - Claim 1. In a device of the class described, a refrigerating drum, means for circulating a refrigerating material within said drum; a compartment mounted on the periphery of said drum; a lid for said compartment arranged to compress the contents of said compartment; means for locking said lid in compressed position; and means for biasing said lid against the drum when locked in compressed position.

Off. Gaz. 456, 461 (1935).

(1955) U. S. 2,009,033, July 23, 1935, T. L. Swenson, Process of Preserving Food Stuffs. - Claim 1. Process of preventing freezer burns on food stuffs comprising: (a) coating said food stuffs with an oil, said oil being substantially saturated with carbon dioxide.

T. V. A., 99-194, p. 7.

(1956) U. S. 2,011,426, Aug. 13, 1935, H. F. Taylor and A. H. Cooke (to Atlantic Coast Fisheries Co.), Storing Frozen Comestibles. - For preventing drying of frozen comestibles such as meats and fish during cold storage, the containers in which they are packed and which may be formed of paperboard are impregnated with air saturated with steam before packing the frozen comestibles in them.

C. A. 29, 6664 (1935).

(1957) U. S. 2,011,465, Aug. 13, 1935, A. K. Balls and W. S. Hale (to the public for free use), Inhibiting the Discoloration of Cut Surfaces of Fruits and Vegetables. - The action of oxidative enzymes is inhibited by treating the cut surfaces with a dilute solution of a sulfhydryl compound such as cysteine or glutathione.

C. A. 29, 6664 (1935).

(1958) U. S. 2,013,016, Sept. 3, 1935, C. W. Vogt (to Vogt Processes, Inc.), Mixing, Pumping, and Freezing Materials such as Ice Cream, Fruit Juices, Eggs, Lard or Lard Substitutes. - Claim 1. A method of processing a liquid

or semi-liquid material, including the steps of continuously advancing the material and a gas into, through and out of a high pressure stage, agitating the material during the movement through a portion of said high pressure stage, but without substantial change in temperature of the material, and subjecting the material and gas to the action of a temperature changing medium while passing through a further portion of said high pressure stage in a substantially quiescent state.

Off. Gaz. 458, 57 (1935).

(1959) U. S. 2,013,017, Sept. 3, 1935, C. W. Vogt (to Vogt Processes, Inc.), Mixing, Pumping and Freezing Materials such as Ice Cream, Fruit Juices, Eggs, Lard or Lard Substitutes. Pumping Mechanism. - Claim 1. A piston type pump including a piston and a cylinder having an inlet and outlet port, a continuously moving inlet valve having a pair of ports therein successively registering with the inlet port during the intake stroke of the piston and including a portion to seal said inlet port on the expelling stroke of the piston, one of said valve ports being in constant communication with a source of liquid, the other of said ports being in constant communication with a source of gas.

Off. Gaz. 458, 57 (1935).

(1960) U. S. 2.013,018, Sept. 3, 1935, C. W. Vogt (to Vogt Processes, Inc.), Mixing, Pumping and Freezing Materials such as Ice Cream, Fruit Juices, Eggs, Lard or Lard Substitutes. - Claim 1. A method of processing material, including the steps of putting the material and a gas under pressure, thereafter dispersing said gas in said material while under a pressure substantially above that of the atmosphere and at a temperature not substantially below that of the atmosphere, to effect at least partial dissolving of the gas, then conducting the material while, under pressure to a freezing chamber, and there subjecting the material subsequently and while still under pressure to the action of a temperature changing medium to change the state thereof, whereby the gas is retained after release of the pressure.

Off. Gaz. 458, 57 (1935).

(1961) U. S. 2,014,550, Sept. 17, 1935, C. Birdseye and B. Hall (to Frosted Foods Company), Refrigerating Apparatus. - Claim 1. Refrigerating apparatus comprising endless impervious belts movable in adjacent paths with parallel opposed faces containing between them material to be congealed, means for positively limiting the approach of the belts throughout their length toward each other, whereby the material, regardless of its consistency, may be molded to a predetermined thickness by the belts, and means for supplying a refrigerant to the outer faces of the belts.

Off. Gaz. 458, 532 (1935).

(1962) U. S. 2,015,167, Sept. 24, 1935, G. Varney, Refrigeration. - Claim 1. In a refrigerating apparatus including a refrigerating chamber an article receivable in and adapted to be passed through said refrigerating chamber, the space between the inner walls of said chamber and said article being filled, in part, with a plurality of liquids of high heat conductivity and of differing specific gravities.

Off. Gaz. 458, 729 (1935).

(1963) U. S. 2,015,168, Sept. 24, 1935, G. Varney, Refrigeration. - Claim 1. As a refrigeration apparatus, a refrigerating chamber, a film of substan-

tially static heat conductive liquid filling the base of said chamber, a carrier passing through said chamber and contacting with said liquid.

Off. Gaz. 458, 729 (1935).

(1964) U. S. 2,019,551, Nov. 5, 1935, G. Varney, Refrigerating Apparatus Suitable for Use With Ammonia, Etc. - Claim 1. As a refrigeration apparatus, a refrigerating chamber, a heat conduction tube extending through said chamber, said tube having a cross-sectional area and a configuration approximating that of the article to be refrigerated to provide for intimate heat exchange between its walls and the said article, and a refrigerated gas of relatively high heat conductivity filling the space between said walls and said article, means for refrigerating said tube, and separate means for refrigerating said gas.

Off. Gaz. 460, 65 (1935).

(1965) U. S. 2,020,719, Nov. 12, 1935, R. R. Bottoms (to Girdler Corp.), Solidifying Liquid Materials such as Milk, Fruit Juices, Soap or Resins, in Finely Subdivided Form. - A liquid material to be solidified and a liquefied refrigerant gas such as liquefied C_3H_8 are introduced into a chamber (of a described apparatus) in such relative proportions that the first-mentioned material is completely solidified and the refrigerant is completely gasified.

C. A. 30, 322 (1936).

(1966) U. S. 2,020,843, Nov. 12, 1935, C. L. Lohner (to Industrial Patents Corporation), Meat Forming. - Claim 1. Process of treating pork tenderloins consisting in: (a) frenching the tenderloins on the sides, (b) cutting into fairly large pieces, (c) conditioning them for forming by freezing, (d) forming the meat into a ribbon, and (e) slicing the ribbon of meat while frozen into patties uniform in cross section.

T. V. A., 99-194-CR, p. 4.

(1967) U. S. 2,021,721, Nov. 19, 1935, S. H. Gibbon (½ to Steel Bros. and Co. Ltd.), Treatment of Rice, Rice Offals or Paddy, and the Like. - Claim 1. Process for treatment of rice consisting in: (a) augmenting its water content to 15 to 30%, (b) subjecting it to a temperature substantially below the freezing point of water, and (c) heating the rice by passing it thru hot water.

T. V. A., 99-192-CR, p. 13.

(1968) U. S. 2,021,971, Nov. 26, 1935, G. Varney, Refrigeration System. - Claim 1. In a refrigeration apparatus, a refrigerated surface, a relatively slidable surface to be refrigerated, said two surfaces being in intimate thermal relation with each other, and a film of heat conductive fluid filling the void between said surfaces.

Off. Gaz. 460, 800 (1935).

(1969) U. S. 2,027,372, Jan. 14, 1936, S. Davison, Apparatus for Freezing Materials. - Claim 1. A freezing apparatus comprising a support and spaced apart on said support a plurality of pairs of separated refrigerated plates of which one is movable relatively to the other, said plates of each pair having a flexible water tight connection between the edges thereof.

Off. Gaz. 462, 290 (1936).

(1970) U. S. 2,030,014, Feb. 4, 1936, G. W. Matthews and C. J. Beust, Method and Apparatus for Preserving Food Products. - Claim 10. In an apparatus for preserving food products, a refrigerating chamber, in combination with independent food product containers independently and removably supported within said chamber, said containers comprising a tray and a cover telescopically related and adapted to contain the food product, said trays being provided with an enlarged base and being located one above the other, means for subjecting the bottoms of the said containers to the liquid refrigerant, whence it freely descends to the top of the container therebelow, said enlarged bases of the containers preventing the refrigerant from having access to the interiors of the covers of the containers, and means for taking off the refrigerant from the chamber.

Off. Gaz. 463, 202 (1936).

(1971) U. S. 2,035,619, Mar. 31, 1936, F. W. Robinson (2/5 to Harry J. Porter and 1/5 to G. D. Elmer), Treating Fruit Juices. - For maintaining juices such as those of citrus fruits, apples or berries in their original nonfree oxygenous and sterile condition, the fruit is cut and the juice is extracted in a nonfree oxygenous atmosphere by first displacing free oxygen with a high-velocity flow of nonoxidizing gas and then maintaining such flow on the fruit, the cutting device, the extracting apparatus, and the juice extracted (various details of apparatus and operation being described).

C. A. 30, 3538 (1936).

(1972) U. S. 2,042,013, May 26, 1936, D. MacBride, Fast Freezing Apparatus. - Claim 1. A fast freezing apparatus consisting of multiple drip-proof heat conducting containers made in two parts, a frame with vertically adjustable arms to support the said containers in a vertical position with relation to each other, horizontal guides attached to the said arms in pairs, refrigerant supply ducts and adjustable refrigerant conductors leading from the said ducts to the horizontal surfaces of said containers, substantially as set forth.

Off. Gaz. 466, 863 (1936).

(1973) U. S. 2,045,627, June 30, 1936, J. H. Wooll, Refrigerating Package for Use with Solid Carbon Dioxide. - Solid CO_2 is used cojointly with absorbent material containing a liquid such as water which is frozen by the refrigerating action of the CO_2 and then served as an auxilliary refrigerant.

C. A. 30, 5472 (1936).

(1974) U. S. 2,052,221, Aug. 25, 1936, J. W. Dubil (½ to E. J. Hubik), Method of Preparing Fresh Meat. - Claim 1. Process of preparing fresh meat, comprising: (a) freezing the meat solid throughout, (b) thawing the meat to approximately 30 to 32° F., and (c) slicing the same into very thin slices.

T. V. A., 99-194, p. 8.

(1975) U. S. 2,052,270, Aug. 25, 1936, H. Zoelly, Preserving Foods in Closed Containers. - Foods are placed in a vessel at a temperature of about 15° C., and there is created in the vessel an atmosphere of solely saturated water vapor by producing a vacuum at which the pressure of the water vapor present corresponds to the total pressure in the vessel at the room temperature, the vessel is sealed air-tight and is stored at a temperature of about 0° C.

C. A. 30, 7237 (1936).

(1976) U. S. 2,053,520, Sept. 8, 1936, F. T. Eisemann (to The King Company), Apparatus for Effecting Quick Freezing. - Claim 2. In combination with a refrigeration chamber filled with cold air, a casing mounted in said chamber and surrounded by the cold air therein, said casing having an air intake passage at one end thereof and an air discharge passage at the opposite end thereof, article-supporting means traversing the length of said casing and a fan associated with said casing and adapted to set up a very rapid forced circulation of cold air drawn from said chamber and directed longitudinally through said casing over the surfaces of material disposed on said article-support.

Off. Gaz. 470, 344 (1936).

(1977) U. S. 2,060,423, Nov. 10, 1936, H. H. McKee and W. McDonald (to Industrial Patents Corporation), Claim 1. Process of defrosting meats consisting in: (a) placing frozen meat products in a closed chamber, (b) admitting steam into chamber to saturate air to thaw meat, (c) circulating air about meat, (d) permitting meat to remain in circulating air until thawed, (e) lowering temperature and decreasing humidity air and permitting meat to remain therein until absorption by meat of surface moisture thereon.

T. V. A., 99-194-CR, p. 5.

(1978) U. S. 2,065,358, Dec. 22, 1936, M. T. Zarotschenzeff (to Z Processes Inc.), Method of Chilling Animal Carcasses. - Claim 1. Process of chilling animal carcasses in a chamber comprising: (a) creating an atomized liquid refrigerant, (b) removing from the refrigerant heavy liquid particles which would form water upon the carcass, (c) directing the remaining refrigerant about the carcass in the chamber, whereby the carcass is chilled in a moisture-laden atmosphere which is free from particles forming water upon the carcass.

T. V. A., 99-194, p. 9.

(1979) U. S. 2,070,729, Feb. 16, 1937, C. A. Harsch and D. A. Fingerhooth, Apparatus for Cooling and Freezing Food Products. - Claim 1. An apparatus for cooling and freezing food products including a compressor; a freezing chamber; a jacket encompassing the walls of said freezing chamber, the annular space inclosed by said jacket about the freezing chamber having a small cross section, said inclosed space constituting a refrigerant holding chamber and being adapted to hold only a relatively small volume of refrigerant; means, including a control valve, for keeping the space inclosed by said jacket constantly filled with liquid refrigerant while the apparatus is operating, said refrigerant holding chamber being divided into two, outer and inner, connected, concentric annular sections; an expansion chamber apart from said annular sections of said refrigerant holdi g chamber but connected therewith by a passage permitting gases emitted by the refrigerant to pass freely into said expansion chamber, said expansion chamber composed of two annular concentric connected sections which inclose, and are connected with a central space; a perforated pipe located in such space, said pipe connected to the suction side of the compressor.

Off. Gaz. 475, 529 (1937).

(1980) U. S. 2,075,472, Mar. 30, 1937, P. Schwary and J. G. Watson (to Louise Gilkey, et al), Spacer for Stacking Cut Meats. - Claim 3. Spacer for stacking meats consisting of: (a) a thin plate-like body of perforated, transparent material, and (b) hollow open-ended members of similar material anchored intermediate the ends thereof in the perforations of

said body plate, each of said hollow members having a slot extending the full length thereof.

T. V. A., 99-194-CR, p. 5.

(1981) U. S. 2,075,473, Mar. 30, 1937, P. Schwary and J. G. Watson (1/5 to Mitchell Schwary et al), Spacer for Stacking Cut Meats. - Claim 4. A spacer for stacked meats consisting of: (a) a plurality of webs connected to one another in vertically edgewise relation and at right angles and supported wholly by virtue of their connections, said webs having apertures providing for circulation of air horizontally throughout the series.

T. V. A., 99-194-CR, p. 5.

(1982) U. S. 2,077,608, Apr. 20, 1937, H. J. Wood (1/3 to Eric Gordon-Hume), Method of and Machine for Freezing Certain Comestibles. - Claim 1. Improved method of freezing material comprising the enclosing of same in a protective covering, passing it in contradirection through a flow of chilled fluid, removing the protective covering and then dipping the material in fresh water.

Off. Gaz. 477, 601 (1937).

(1983) U. S. 2,080,103, May 11, 1937, M. T. Zarotschenzeff (to Z Processes Inc.), Method and Apparatus for Refrigerating Food Products. - Claim 1. Device for quick freezing food products comprising: (a) an elongated chamber, (b) means to supply a quick freezing refrigerant under pressure, (c) means positioned within the chamber and communicating with the supply means for directing the refrigerant in spray and finely divided form in a direction to impinge against the exposed surfaces of the products passing through the chamber, whereby the refrigerant will impinge against substantially all portions of the products and transfer heat therefrom by conduction resulting from direct impact contact thereof with all portions of the products, and (d) means to introduce products into the chamber at one end thereof and remove the same at the other end thereof to cause the products to move through the chamber.

T. V. A., 1937 Report, p. 39.

(1984) U. S. 2,085,051, June 29, 1937, R. B. Taylor (to Tennessee Valley Authority), Treating Green Corn. - Claim 1, Process for preserving green corn, which comprises: (a) husking, removing silk and cleaning an ear of corn, (b) freezing the cleaned ear of corn to the extent that at least all of the grains of corn are completely frozen, (c) shelling the frozen grains of corn, with all grains substantially completely intact, from the cob, and (d) preserving the shelled grains of corn in a closed container.

T. V. A., 99-193, p. 7.

(1985) U. S. 2,093,069, Sept. 14, 1937, R. H. Bedford, Frozen Flesh Foods such as Fish. - Flesh foods are provided with a substantially noncracking ice glaze formed of a frozen composition comprising water and a compound such as boric acid, Na_2SO_4, or Na_2HPO_4, forming a eutectic composition having a eutectic temperature of from about -0.5° C. to about -2.1° C.

C. A. 31, 8060 (1937).

(1986) U. S. 2,093,865, Sept. 21, 1937, F. E. Denny (to Boyce Thompson Institute for Plant Research, Inc.), Inhibiting Discoloration of Cut Surfaces

such as those of Apples. - The cut surfaces are exposed to the action of a thioamide compound as by a dilute thiocarbamide solution.

C. A. 31, 8060 (1937).

(1987) U. S. 2,097,479, Nov. 2, 1937, R. B. Taylor, Removing Skin from Fruits. - Claim 1. Process of preparing fruits for use as a comestible, which comprises, quick freezing the fruit so that only the outer portion of the flesh is solidified, leaving the portion around the pit or core unfrozen; defrosting to the extent that substantially only the skin is thawed out; abrading the skin from the fruit so defrosted; and removing the pit or core.

Off. Gaz. 484, 68 (1937).

(1988) U. S. 2,102,506, Dec. 14, 1937, F. O. S. Bland, Preserving Perishable Foodstuffs by Rapid Freezing. - Food stuffs such as meats, fruits, fish, etc. are immersed in a liquid chilling medium, cooled to at least -30° C., containing pure glycerol 20-40, ethyl alcohol, 20-40, and water 25-45% to effect rapid freezing.

C. A. 32, 1350 (1938).

(1989) U. S. 2,103,925, Dec. 28, 1937, W. M. Zarotschenzeff (to Z Pack Corporation), Method of Freezing Fruits. - Claim 1. Method of treating edible products having pits, comprising: (a) quick freezing the same, (b) pitting the same while frozen, and (c) packing the same with sugar syrup in containers for cold storage.

T. V. A., 99-193, p. 7.

(1990) U. S. 2,110,410, Mar. 8, 1938, S. Westby and W. E. Lund, Preservation of Fresh Flesh Products. - Claim 1. Process of preserving fresh flesh products in cold storage and protecting them from desiccation and freezer burn by: (a) enclosing said products with a wrapper of paper which has been previously impregnated with oil to form a film nonpermeable by moisture, which is persistent under the conditions of cold storage, and which wrapper after such impregnation has been coated with wax to prevent absorption of oil film by surfaces with which wrapper may come in contact, during preservation, (b) subjecting wrapped products to cold storage at temperatures suitable for the preservation of the particular flesh product.

T. V. A., 99-194-CR, p. 6.

(1991) U. S. 2,114,530, Apr. 19, 1938, T. S. Gorton, Jr., Method of Packing Blocks of Comestibles for Freezing and Product Thereof. - Claim 3. Method of packing units of comestibles in multiple layers for block freezing which consists in: (a) individually wrapping units of comestibles, (b) packaging wrapped units in separate sections within a block molding receptacle, (c) introducing between adjacent sections as formed, a sheet of moisture resistant pellicle of pliable material and a superposed strip of tough pliable material to serve as a splitting member, and (d) freezing adjacent sections and interposed sheet strip in one solid compacted block.

T. V. A., 99-195, p. 6.

(1992) U. S. 2,116,738, May 10, 1938, M. T. Zarotschenzeff (to Z Pack Corporation), Method and Apparatus for Freezing Vegetables and Fruits. - Claim 1. A method of freezing vegetables and fruits comprising causing the same to be rotated about an axis and about their own axes while passing through a chamber and subjecting the same to freezing by conduction and convection from refrigerating sources acting exteriorly and interiorly of said chamber.

Off. Gaz. 490, 340 (1938).

(1993) U. S. 2,117,215, May 10, 1938, V. Ruch, Fruit Juice Extracting and Distributing Method. - Claim 1. Fruit juice extracting and distributing method which comprises; (a) precooling the whole fruit before cutting, (b) extracting the juice while the fruit is cold, (c) subjecting the juice to a partial vacuum, and then to atmospheric pressure, (d) again subjecting the juice to a partial vacuum, while agitating and slowly freezing the juice to slush form, (e) then freezing the slush to solid form and keeping in solid form until ready for use, and (f) then defrosting.

T. V. A., 99-192-CR, p. 15.

(1994) U. S. 2,119,716, June 7, 1938, H. H. McKee (to Industrial Patents Corporation), Method of Treating Bacon. - Claim 1, Method of treating bacon which consists in: (a) arranging skinned slabs of bacon with their fat and lean surfaces in superposed relationship in a form of less area than the slabs, (b) applying pressure against the slabs to flatten the fat and lean surfaces and to reduce the area of the slabs to correspond to the area of the form, and (c) subjecting the slabs while under pressure to a temperature sufficiently low and for a sufficient length of time to cause the slabs to set.

T. V. A., 99-194-CR, p. 6.

(1995) U. S. 2,128,728, Aug. 30, 1938, G. A. Hormel (to George A Hormel and Company), Apparatus for Defrosting Meat. - Claim 1. Apparatus for defrosting meat and the like, comprising: (a) treating compartment in form of elongated horizontal trough having end walls and having longitudinal walls formed with narrow inwardly opening channels extending lengthwise thereof, (b) return flow compartment extending lengthwise said treating compartment, (c) communicating passages provided at both ends of said compartments for flow of water therethrough, (d) means for propelling water from return flow compartment into treating compartment at one end thereof to maintain continuous flow of water longitudinally thru said channels and trough space.

T. V. A., 99-194-CR, p. 7.

(1996) U. S. 2,129,572, Sept. 6, 1938, W. J. Finnegan, Means for Freezing and Preserving Comestibles. - Claim 1. In the rapid freezing of comestibles: (a) a hermetically sealed container for comm. use adapted to be externally subjected to a heat transfering vehicle, (b) a heat transmission element in the container including a plate having its ends in contact with walls of container at the approximate center thereof to multiply the final points of solidification, and (c) fins carried by the plate and extending towards the walls of the container and terminating in spaced relation to the walls of the container.

T. V. A., 99-193-CR, p. 4.

(1997) U. S. 2,130,237, Sept. 13, 1938, G. A. Hormel (to George A. Hormel and Company), Method of Defrosting Meat. - Claim 1. Method of defrosting meat which comprises: (a) immersing pieces of meat in body of hot water at a charging station, (b) propelling water to cause it to flow as a stream thru and among pieces of meat and move them progressively, (c) directing course of water and meat to a discharge point while retarding progress of meat relative to that of water, (d) reheating water after it has passed discharge point, and (e) then propelling it again among pieces of meat, and (f) removing pieces of meat from water at discharging point.

T. V. A., 99-194, p. 9.

(1998) U. S. 2,131,131, Sept. 27, 1938, M. T. Zarotschenzeff (to Z Pack Corporation), Apparatus for Refrigeration. - Claim 1. In a refrigerating apparatus including a chamber, a carrier movable into said chamber and having a series of shelves supporting food products, and means on said carrier for discharging refrigerating media to contact the food products carried thereon substantially on all surfaces thereof.

Off. Gaz. 494, 790 (1938).

(1999) U. S. 2,133,021, Oct. 11, 1938, G. K. S. Ferguson (to The Baltimore Paper Box Company), Package. - Claim 2. Primary carton formed of fiber board with: (a) top portion, (b) bottom portion, (c) side wall portions and end wall portions, certain oppositely disposed portions of carton being provided with aligned ventilating openings, (d) vent flue in carton communicating with openings and secondary telescopic containers arranged within carton, and only partially filling space within carton, and (e) means placing unoccupied space within carton in communication with flue.

T. V. A., 99-193-CR, p. 5.

(2000) U. S. 2,133,483, Oct. 18, 1938, T. M. Shaw and L. T. Alexander (to the public for free use), Determining the Freezing Point of the Aqueous Content of Various Materials. - A method of determining the temperature of ice formation in various materials such as water, soil, sucrose solutions, or various vegetable materials comprises determining their dielectric constant as a function of decreasing temperature of the material and noting the temperature at which the dielectric constant changes owing to the formation of ice.

C. A. 33, 440 (1939).

(2001) U. S. 2,134,295, Oct. 25, 1938, M. T. Zarotschenzeff (to Z Pack Corporation), Method of Preserving Full Dressed Poultry. - Claim 1. Process of preserving animal carcasses which comprises: (a) cleaning and drawing the entrails thereof, and (b) quick freezing the resulting carcasses by directing a fluid freezing medium having antiseptic properties against the inner and outer surfaces of the carcasses to flush and sweep the surfaces and cause a rapid flow of the freezing medium over the carcasses.

T. V. A., 99-194, p. 9.

(2002) U. S. 2,136,041, Nov. 8, 1938, C. J. Conn, Method of and Apparatus for Treating Food Products. - Claim 1. Method of assembling food products of the class described for freezing, comprising: (a) disposing an open ended frame on a base having a shaping member, (b) packing individual products between the shaping member and the walls of the frame, (c) disposing a screen over the remaining open end of the frame, (d) inverting the assembly, and (e) removing the base and the shaping member therefrom, whereby exposed surfaces of the food products are disposed at the top and bottom of said assembly for direct contact with the refrigerant.

T. V. A., 99-192-CR, p. 15.

(2003) U. S. 2,137,205, Nov. 15, 1938, W. W. Cowgill (to Sardik Inc.), Treatment of Food Materials. - Claim 1. Process of preserving fresh fruit and vegetable materials substantially without loss of juice during period of preservation, which consists in: (a) packing the fresh material in a container, (b) dispersing particles of substantially pure, non-acid pectin in non-hydrated, non-gelatinous condition throughout fresh material and in

intimate contact with surfaces thereof, so as to be capable of readily combining with any juice exuded from the material, (c) agitating material during preserving operation to facilitate intimate mixing of fresh material and pectin, and (d) freezing material in container.

T. V. A., 99-193, p. 8.

(2004) U. S. 2,137,897, Nov. 22, 1938, H. H. McKee and F. Seaver (to Swift and Company), Meat Packing Method. - Claim 1. Method of treating meat which comprises: (a) sharp-freezing the meat to a temperature of zero degrees F. or lower in a rapid draft of frigid atmosphere, (b) thereafter tempering the meat to equalize the temperature thruout, (c) slicing the meat with a knife edge cutter, (d) reassembling the slices, and (e) subsequently again reducing the temperature thereof to zero degrees F. or lower.

T. V. A., 99-194-CR, p. 7.

(2005) U. S. 2,137,902, Nov. 22, 1938, C. T. Walter (to Industrial Patents Corp.), Quick Freezing Foods such as Poultry. - Various details of apparatus and operation suitable for use with liquid CO_2. Claim 8. The method of quick freezing food products which comprises submerging the food in a liquefied refrigerant in a closed system under pressure, continuously withdrawing gaseous refrigerant, continuously returning liquefied refrigerant at a substantially constant low temperature until completion of the freezing process and thereafter withdrawing all of the liquefied refrigerant from the system.

C. A. 33, 1831 (1939).
Off. Gaz. 496, 1059 (1938).

(2006) U. S. 2,140,043, Dec. 13, 1938, M. T. Zarotschenzeff (to Z Pack Corporation), Freezing with Fruit Juices. - Claim 1. Method for refrigerating edible products comprising: (a) spraying the products in their natural state with a refrigerated solution consisting of sugar and juice of said product that freezes the product without affecting adversely any of the natural properties of said product.

T. V. A., 99-198, p. 6.

(2007) U. S. 2,140,162, Dec. 13, 1938, H. H. McKee (to Swift and Company), Meat Treating Method. - Claim 1. Method which consists in: (a) quickly chilling a fresh carcass portion to such degree that exterior part is more or less frozen while inner part still remains relatively unfrozen, (b) tempering said carcass portion as a whole by letting it stand at higher temperature for brief period of time sufficient for temperature to equalize throughout and bring meat to a condition of rigidity for slicing, and (c) slicing the carcass part by spaced knifelike cuts.

T. V. A., 99-194-CR, p. 7.

(2008) U. S. 2,145,323, Jan. 31, 1939, E. Stafford (to Z Pack Corporation), Defrosting and Refreezing Apparatus. - Claim 1. Apparatus for treating frozen food products comprising: (a) a chamber forming means having entrance and discharge means at opposite ends thereof, (b) means to support food products as they are directed thru the chamber, (c) means at the entrance to direct a spray of a defrosting medium upon food products on the supporting means, and (d) means between defrosting means and discharge means to enable defrosted portion of the food products to be refrozen.

T. V. A., 99-192-CR, p. 16.

(2009) U. S. 2,145,393, Jan. 31, 1939, W. D. Hergert (to San Juan Fishing and Packing Company), Frozen Food Product and Method of Ice Glazing Same. - Claim 2. A frozen food product having a protective glazing of ice; said glazing comprising: (a) a plurality of superimposed layers, at least one of which is porous, to give whiteness to the glaze.

T. V. A., 99-192, p. 7.

(2010) U. S. 2,145,637, Jan. 31, 1939, C. E. Smith ($\frac{1}{2}$ to R. H. Coffin), Freezing Apparatus. - Claim 1. In a freezing apparatus of the character described, a tunnel having walls of insulation, an endless conveyor extending lengthwise of the tunnel for conveying products to be frozen from one end to the other of the tunnel, a vertically arranged baffle assembly disposed in the tunnel and extending longitudinally of the conveyor at one side of the latter, a spray mechanism disposed at the side of the baffle assembly opposite to the conveyor for spraying a freezing medium within the tunnel, and a battery of power driven fans arranged within the tunnel and extending longitudinally thereof, and said spray means being interposed between the fans and said baffle means.

Off. Gaz. 498, 1102 (1939).

(2011) U. S. 2,150,616, Mar. 14, 1939, R. Thilenius (to Deutsche Gold und Silber-Scheideanstalt vom. Roessler), Preserving Fish, Meat and Other Perishable Foods. - The material to be preserved is brought in contact with an ice containing H_2O_2 such as may be prepared by use of a cooled rotating drum for rapid freezing of a solution containing about 0.1 -0.5% H_2O_2 and a buffer salt such as $NaHSO_4$ or betaine-HCl to maintain a pH of 3 to 5.

C. A. 33, 4694 (1939).

(2012) U. S. 2,151,967, Mar. 28, 1939, C. A. Hedreen and H. R. Beard (to New England Fish Co.), Preserving Foods such as Fish and other Seafoods. - The material is frozen to a temperature between about -15° and -45° C. and provided with a protective ice-glaze containing about 1% or less of sucrose, dextrose, NaCl, Na_2CO_3, $NaHCO_3$, Na_2HPO_4, Na_3PO_4, NaH_2PO_4, or Na_2SO_4. One claim specifies, as a new article, a frozen flesh food in an encasement comprising: (a) a tough adherent, substantially air-tight ice-glaze coating having a lower freezing-point and substantially greater resistance to cracking, peeling and fracture than pure water-ice and formed of a frozen solution of water and an edible non-injurious solute characterized by its ability to so reduce the freezing-point and increase the toughness of the glaze.

C. A. 33, 5086 (1939).
T. V. A., 99-195, p. 6.

(2013) U. S. 2,153,742, Apr. 11, 1939, C. J. Conn, Apparatus for Quick Freezing of Food Products. - Claim 3. In an apparatus of the class described, spaced perforated conveyors upon which food products are disposed for movement in bank formation for treatment, conduits between the respective conveyors and having spaced and vertically opposed nozzles for discharging spray refrigerant upwardly and downwardly against the food products, and separator plates supported on said conduits for defining separate freezing zones for said food products and having apertures through which the upwardly extending nozzles of said conduits project for permitting discharge of refrigerant in a zone above the separator plates, and separator plates having downwardly sloping edges, whereby used spray refrigerant after heat exchange with the food products in the respective zones may be directed out of said zones and away from the remaining zones.

Off. Gaz. 501, 377 (1939).

(2014) U. S. 2,161,071, June 6, 1939, L. J. McGrath and W. L. Hall (to Zellerbach Paper Company), Method of Packing Frozen Food. - Claim 1. Method of packing a product to be frozen in a moisture-proof container which comprises: (a) partially filling the container, (b) applying pressure to raise the level of the contents of the container, (c) sealing the container, (d) releasing the pressure, and (e) then freezing.

T. V. A., 99-192-CR, p. 16.

(2015) U. S. 2,162,213, June 13, 1939, C. J. Conn, Process of Freezing Food Products. - Claim 1. Method of treating frozen food products, comprising: (a) treating said products successively with warm, edible liquid and an air blast above freezing to defrost the surface of the same, (b) quick freezing the defrosted surface, and (c) thereafter glazing the same.

T. V. A., 99-192, p. 7.

(2016) U. S. 2,162,214, June 13, 1939, C. J. Conn, Treatment of Food Products. - Claim 1. Method of treating food products prior to quick freezing comprising: (a) chilling the same by contact with a liquid, and (b) subjecting the chilled product to a blast of air at freezing temperatures to disperse and evaporate substantially all the liquid on the surface of the products and to form minute crystals in the surface pores, thereby to provide a substantially impervious shell formation.

T. V. A., 99-192, p. 8.

(2017) U. S. 2,164,362, July 4, 1939, R. B. Taylor (to Tennessee Valley Authority), Freezing Foods. - Claim 2. Process of freezing a fruit for preservation thereof which comprises: (a) maintaining at a temperature of 0 - 10° F. an aqueous invert sugar solution which has a freezing point not higher than 5° F., and low viscosities at 0° to 10° F., (b) immersing the fruit in a body of said solution, (c) circulating the solution in direct contact with the fruit at such a rate that the fruit is quickly frozen with the formation of only small crystals therein, (d) removing the frozen fruit from the solution and (e) separating substantially all of the solution from the fruit.

T. V. A., 99-192-CR, p. 16.

(2018) U. S. 2,166,113, July 18, 1939, R. H. Bedford, Frozen Material. - Claim 2. Frozen flesh foods having an ice glaze formed of water containing bensoic acid in an amount to impart noncracking characteristics to said ice.

T. V. A., 99-195, p. 7.

(2019) U. S. 2,166,278, July 18, 1939, S. W. Alderfer, Food Product and Method of Making the Same. - Claim 1. Method of making a food product which comprises (a) boiling white potatoes, (b) mashing, (c) whipping and seasoning the same, and (d) then, while still hot, subjecting them to sharp freezing to inhibit hydrolysis therein.

T. V. A., 99-193, p. 9.

(2020) U. S. 2,172,417, Sept. 12, 1939, R. B. Taylor (to Tennessee Valley Authority), Washing Food with Refrigerant. - Claim 1. In the freezing of fruits and vegetables by direct contact thereof with a refrigerant solution, the improvement which comprises: (a) washing the previously unwashed food solely with the refrigerant solution used in the freezing operation.

T. V. A., 99-198, p. 7.

(2021) U. S. 2,172,418, Spet. 12, 1939, R. B. Taylor (to Tennessee Valley Authority), Separating Refrigerant from Frozen Foods. - Claim 1. In freezing of foods by direct contact thereof with an aqueous refrigerant solution, the step which comprises: (a) positively removing from the frozen food, after freezing operation, so much of the adherent refrigerant solution that residual solution is insufficient in amount to lower freezing point of food juices in surface layers to temperature at which frozen food is to be stored.

T. V. A., 99-198, p. 7.

(2022) U. S. 2,174,649, Oct. 3, 1939, S. J. Bailey (½ to W. Schlesinger), Method of Preserving Drawn and Dressed Fowls. - Claim 1. The method of preserving fowl which comprises: (a) drawing and dressing the fowl, (b) placing its giblets in its cavity, and (c) closing cavity openings by submerging portions of the fowl containing openings in water, and (d) freezing the fowl and the water, causing ice seals to form around the openings only.

T. V. A., 99-194, p. 10.

(2023) U. S. 2,175,176, Oct. 10, 1939, C. A. Bulkeley and M. H. Olstad,(to Niagara Blower Company), Apparatus for Freezing and Cooling Foods. - Claim 1. A cooling system for freezing foods in a freezing room, comprising a casing, cooling means in said casing, means for passing an air stream through said casing and circulating the air stream over said foods, means for supplying a cooling medium to said cooling means and maintaining the temperature of the cooling means and the temperature of all the air leaving said coils well below the freezing point of said foods, means for passing a liquid over the exterior of said cooling means, a second casing, a cooling coil in said second casing, means for collecting the liquid in said first casing after passing over the cooling means therein and passing it directly through the coil in said second casing, means for passing an air stream through said second casing, means for controlling the amount of cooling medium admitted to the cooling means in said first casing in response to the temperature maintained by the air leaving said first casing and means for controlling the amount of liquid admitted to the coil of said second casing in response to the temperature maintained by the air leaving said second casing.

Off. Gaz. 507, 275 (1939).

(2024) U. S. 2,175,680, Oct. 10, 1939, R. H. Bedford, Frozen Foods such as Fish. - Foods such as fish are provided with a transparent noncracking ice glaze formed from an aqueous solution of a polyhydric alcohol, ketonic alcohol, or aldehydic alcohol such as glycerol, ethylene glycol, arabinose, glucose mannose, galactose, fructose, sucrose, or maltose, preferably, brought to a pH of about 5.5 as by use of HCl.

C. A. 34, 827 (1940).

(2025) U. S. 2,176,764, Oct. 17, 1939, G. L. Gross (to Northern Cold Storage and Warehouse Co.), Fish Freezing Arrangement. - Claim 1. Combination with a fish freezing pan, of two layers of fish arranged therein, one layer above the other and a metallic plate interposed between said layers and arranged to prevent interfreezing of the top and bottom layers.

T. V. A., 99-195, p. 7.

(2026) U. S. 2,182,556, Dec. 5, 1939, D. W. Griswold, Method and Apparatus for Preservation of Perishable Foodstuffs. - Claim 4. Method of freezing

foodstuffs which consists in: (a) continously moving individual pieces of fruit or vegetables in heat exchange relationship with refregerating medium for freezing pieces individually, (b) subjecting pieces to blast of cooled air at start of their movement in heat exchange relationship with refrigerant medium to quickly form a frozen outer crust on pieces, and (c) agitating pieces to cause tumbling movement thereof during their movement in heat exchange relationship with refrigerating medium.

T. V. A., 99-193-CR, p. 5.

(2027) U. S. 2,183,732, Dec. 19, 1939, M. T. Zarotschenzeff (to Z Pack Corporation), Frame Freezing. - Claim 1. A method of freezing food products characterized by the steps of placing the same in a frame composed of relatively movable sections, pressing the frame against the products to shape and restrain the products therein in a desired fashion and subjecting the products within the frame to a refrigerant.

Off. Gaz. 509, 622 (1939).

(2028) U. S. 2,184,954, Dec. 26, 1939, C. J. Conn, Method for Quick Freezing of Food Products. - Claim 3. A method of refrigerating products comprising discharging refrigerant in the form of a continuous film or sheet, and acting on such film or sheet to cause the same to contact tangentially with the surfaces of the products being treated.

Off. Gaz. 509, 995 (1939).

(2029) U. S. 2,184,990, Dec. 26, 1939, C. J. Conn, Method and Apparatus for Quick Freezing of Food Products. - Claim 1. Method of handling food products, comprising (b) disposing said frames in vertical spaced relationship with respect to one another, and (c) discharging spray refrigerant laterally across and in the zone between frames only, whereby said spray refrigerant contacts substantially only the surfaces of the food products exposed at the open tops and bottoms of the respective frames.

T. V. A., 99-194-CR, p. 8.

(2030) U. S. 2,190,151, Feb. 13, 1940, E. G. Hawkins, Method of Deaerating Frozen Foods. - Claim 1. Process of preserving food which comprises: (a) subjecting the food to a sub-freezing temperature, (b) comminuting the frozen food, (c) pressing the frozen, comminuted food under a relatively light pressure to remove air from the interstices of the food mass, (d) releasing the pressure, and (e) then subjecting the deaerated mass to a relatively heavy pressure to break the food cells and exhaust the gaseous matter therefrom.

T. V. A., 99-192, p. 8.

(2031) U. S. 2,194,684, Mar. 26, 1940, R. H. Bedford, Ice-glazing Foods such as Fish for Storage or Transportation. - A transparent ice-glaze on fish, etc., is formed of water containing HCl (suitably to give a pH of about 1), which gives a noncracking character to the ice. Cf. U. S. 2,175,680.

C. A. 34, 830 (1940).

(2032) U. S. 2,196,080, Apt. 2, 1940, R. G. Reynoldson, Method for Forming Materials. - Claim 1. Method of changing the accidental shape of a unitary slab of self sustaining edible material resulting from the separation of

such slab from an edible carcass by (a) positioning said slab within a telescopic forming container, the side walls of which define the desired peripheral form of the article, (b) subjecting the top and bottom of the slab to such pressure while in said container as to cause its lateral deformation until its edges conform to the side walls of interior of container, and (c) chilling the slab while in container and thereby setting it in desired form.

T. V. A., 99-194, p. 10.

(2033) U. S. 2,196,643, Apr. 9, 1940, J. Reeh, Plant for Freezing and Storing Fish on Ships. - Claim 1. A refrigerating plant for freezing fish wherein the fish are conducted through brine cooled to a low temperature, including a vertically elongated vessel for containing the brine and having an inlet opening and an outlet opening at opposite sides of the upper part of the vessel, conveyor pulleys within the upper and lower ends of the vessel, endless conveyor means trained around said pulleys and dividing the vessel into a central compartment and lateral compartments communicating at their sides, division plates carried by said conveyor means and passing the vessel openings, said plates being inclined with respect to the conveyor means to slope downward towards the conveyor means when passing the said inlet opening, and means within the central compartment causing circulation of brine through the several compartments.

Off. Gaz. 513, 399 (1940).

(2034) U. S. 2,199,485, May 7, 1940, A. W. Devout (to Industrial Patents Corporation), Food Storage. - Claim 2. Method of humidifying refrigerated chambers which comprises: (a) introducing water in the form of a mist at a sufficiently high rate to suspend finely divided supercooled water in the atmosphere of the chamber, and (b) positively circulating the moisture laden air in the chamber.

T. V. A., 99-194, p. 10.

(2035) U. S. 2,200,331, May 14, 1940, A. R. Fisher, Apparatus for Freezing Berries. - Claim 8, A quick freezing apparatus comprising: (a) a casing, (b) a substantially vertical shart rotatively supported in casing, (c) deflecting plates on the shaft stationary guiding plates between the shaft plates, (d) means to deliver berries to the plates at one end of shaft, (e) means to freeze the berries on plates, (f) means to rotate the shaft with the plates, and (g) means to progressively move the berries from one deflecting plate to another for separating frozen berries.

T. V.A., 99-193, p. 10.

(2036) U. S. 2,203,454, June 4, 1940, W. W. Bowers (to Wilson and Company), Method for Leaching Meat. - Claim 1. Method of leaching and thawing frozen meat which comprises: (a) immersing the frozen meat in a brine bath, (b) continuously removing brine from the bath and supplying fresh brine thereto at a relatively higher temperature, and (c) circulating the warmer brine uniformly upwardly about the meat while maintaining substantially uniform horizontal temperature conditions in the bath.

T. V. A., 99-194, p. 11.

(2037) U. S. 2,209,137, July 23, 1940, J. Reeh, Refrigerating Plant. - Claim 8. A refrigerating apparatus including a band and a thermo-conductive

wall, with the band movable and defining with the wall a spaced vertical passage, article supporting elements carried by the band and substantially bridging the space between the band and the wall, and means for directing a refrigerating agent into direct contact with the outer surface only of the wall and into direct contact with the inner surface only of the band.

Off. Gaz. 516, 985 (1940).

(2038) U. S. 2,210,946, Aug 13, 1940, W. E. Moore, Package Refrigeration. - Claim 1. Heat absorbing body adapted to be placed within a shipping case to refrigerate perishable goods packed therein, comprising: (a) sawdust and a binder therefor pressed into a block, and (b) brine only substantially saturating the sawdust, the absorbed brine being frozen, and the block being homogenous and retaining its shape in both the frozen and the melted conditions of the brine.

T. V. A., 99-192-Cr, p. 17.

(2039) U. S. 2,211,153, Aug. 13, 1940, H. A. Noyes (to Z Pack Corporation), Refrigerants for Freezing Foods. - A refrigerated solution which is suitable for quick freezing foods by spraying on them and which is free from salty or bitter taste contains NaCl about 10-18% and sugar 20-36%. Invert sugar may be used.

C. A. 35, 531 (1941).

(2040) U. S. 2,211,387, Aug. 13, 1940, A. C. Routh, Apparatus for Continuous Congealing of Fluids such as Melted Lard. - Various structural and operative details of an apparatus with a float-controlled valve.

C. A. 35, 351 (1941).

(2041) U. S. 2,214,153, Sept. 10, 1940, B. E. Williams and L. L. Caldwell, (to Swift and Company), Method of Treating Carcasses. - Claim 1. Method of treating freshly skinned lamb carcasses by: (a) applying two layers of brine moistened cloth over skinned surface of hot skinned lamb, (b) enclosing in wrapper impervious to atmospheric moisture, (c) freezing, (d) removing wrapper, (e) defrosting at about 42° F., (f) conditioning at about 32° F. to permit moisture on the cloths to evaporate and to completely defrost the carcass.

T. V. A., 99-194-CR, p.8

(2042) U. S. 2,214,398, Sept. 10, 1940, R. H. Bedford (½ to A. T. Sherman), Frozen Foods such as Fish. - Frozen foods such as fish are provided with a transparent ice glaze formed of an aqueous solution having a pH of about 5.5 and containing sufficient H_2O_2 to give the glaze a non-cracking character. Cf. U. S. 2,175,680.

C. A. 35, 819 (1941).

(2043) U. S. 2,215,485, Sept. 24, 1940, A. J. Stone (½ to R. L. Hague; City Bank Farmers Trust Co. and W. E. Godfrey, executors for R. L. Hague, deceased), Refrigerating Apparatus. - Claim 1. A refrigerating apparatus comprising a continuously rotating freezing drum having freezer compartments formed between refrigerant chambers, with walls substantially parallel to and radiating from the drum axis, into which compartments the articles to be frozen are introduced at one position and withdrawn in frozen condition after the rotating drum has revolved sufficiently to insure the desired degree of freezing.

Off. Gaz. 518, 821 (1940).

(2044) U. S. 2,215,486, Sept. 24, 1940, A. J. Stone (½ to R. L. Hague; City Bank Farmers Trust Co. and W. E. Godfrey, executors for R. L. Hague, deceased), Refrigerating Apparatus. - Claim 1. In a refrigerating apparatus, a housing, and a rotatable drum mounted in said housing, said drum comprising a plurality of refrigerant chambers with walls substantially parallel to and radiating from the drum axis and placed to provide freezer compartments therebetween, adjacent chambers being movable relatively to each other to vary the space therebetween.

Off. Gaz. 518, 821 (1940).

(2045) U. S. 2,216,127, Oct. 1, 1940, R. P. McNaught, Perishable Mark for Frozen Foods. - Claim 1. Method of marking a frozen product which consists in: (a) spraying water onto the container carrying the product to form a layer of ice thereon by the water contacting with the frozen product, (b) placing a stencil on ice surface and holding the container so that the ice surface and stencil lie in a horizontal plane, and (c) spraying a colored liquid upwardly against the stencil for applying a freezable mark to the layer of ice, the mark freezing when contacting the layer of ice.

T. V. A., 99-192, p. 8.

(2046) U. S. 2,221,220, Nov. 12, 1940, D. A. Pack, Method and Machine for Freezing Edible Products. - Claim 1. Apparatus for freezing food products comprising: (a) elongated insulated freezing chamber, (b) fixed hollow guide in chamber, (c) means for cooling trough with refrigerant, (d) movable food trough adjacent to fixed trough, (e) means to conform belt to fixed trough, (f) means for depositing food on belt, (g) flexible belt coacting with movable trough to move product, (h) means for moving belt at same speed as food, (i) spaced flights on belt for dividing food, and (j) means for cooling belt and food product.

T. V. A., 99-193, p. 12.

(2047) U. S. 2,222,087, Nov. 19, 1940, R. F. Parsons (to Harvey and Co.), Method for Treating Comestibles. - Claim 1. Method of freezing comestibles which comprises: (a) passing an electric current thru the comestibles to inhibit the rupture or breakdown of the cellular structure thereof during freezing, and (b) freezing the thus-treated comestibles.

T. V. A., 99-195, p. 8.

(2048) U. S. 2,223,972, Dec. 3, 1940, H. W. Sterling, Method and Apparatus for Freezing Comestibles. - Claim 11. In an apparatus for freezing comestibles, the combination of: (a) sprockets, (b) continuous conveyor in the form of a series of connected foraminous pans mounted on said sprockets and adapted to move continuously for carrying comestibles through a cooling medium, and (c) an agitator in the cooling medium above the conveyor adapted to agitate comestibles prior to their delivery to the continous conveyor and during the freezing of outer surfaces thereof to prevent adherence of the comestibles to other objects during the freezing of the comestibles.

T. V. A., 99-193, p. 12.

(2049) U. S. 2,225,627, Dec. 24, 1940, E. W. Flosdorf (to F. J. Stokes Machine Company), Method for the Concentration and Preservation of Food Products and Biological Substances. - Claim 5. Process of treating and preserving liquid or semiliquid food or biological substances which comprises: (a) degassing the material by subjecting it to a moderate vacuum

at above freezing temperatures, for a period of not less than about 15 minutes, (b) thereafter subjecting the material to a high vacuum to effect freezing thereof, and (c) removing the water vapor as rapidly as it is drawn off.

T. V. A., 99-193-CR, p. 6.

(2050) U. S. 2,225,669, Dec. 24, 1940, R. B. Taylor (to Tennessee Valley Authority), Purification of Refrigerant. - Claim 1. Method of purifying aqueous refrigerant solutions contaminated with food debris from direct contact with foods which comprises: (a) chilling the solution until a relatively small amount of crystallization has occurred, and (b) thereafter separating the crystals and accompanying debris from the solution.

T. V. A., 99-198, p. 5.

(2051) U. S. 2,228,998, Jan. 14, 1941, C. Birdseye (to Mechanical Research, Inc.), Refrigerating Apparatus. - Claim 4. Freezing apparatus including in its structure: (a) an upright closed casing having a series of stationary circular refrigerated shelves therein, (b) means for delivering to an upper shelf a product to be frozen, and (c) means acting to move the product in substantially circular paths in the spaces between the shelves while holding it spread out with substantially uniform distribution on the surface of certain of the shelves.

T. V. A., 99-192-CR, p. 18.

(2052) U. S. 2,228,999, Jan. 14, 1941, C. Birdseye (to Mechanical Research), Art of Freezing Food Products. - Claim 1. Process of freezing food products which consists in: (a) spreading the product on a flat heat-conductive refrigerated plate, (b) forcibly separating the product from the plate in an advancing wave, and (c) advancing the product along the plate at a speed less than that of the wave of separation.

T. V. A., 99-193, p. 12.

(2053) U. S. 2,229,000, Jan. 14, 1941, C. Birdseye (to Mechanical Research, Inc.), Refrigerating Apparatus. - Claim 1. In apparatus for freezing food products, the combination of a member having a flat refrigerated surface, and means for spreading over said surface a shallow layer of food product for advancing said product along and in direct contact with said surface and for simultaneously removing congealed moisture from said surface.

Off. Gaz. 522, 466-7 (1941).

(2054) U. S. 2,231,886, Feb. 18, 1941, J. N. Crider, Method of Preserving Dressed and Drawn Fowl. - Claim 3. That method of preserving dressed and drawn fowl, which consists in passing a tube through the carcass and the cavity therein, placing the carcass in a mold having a contour conformable to the breast and oppositely disposed back surface with the sides of the mold cut away or depressed between the back and breast faces to accommodate the joints between the legs and thighs, filling the cavity in the carcass with water, positioning the legs of the fowl with reference to the body of the carcass to simulate a trussed fowl and securing them in such position, and passing a freezing medium through the tube.

Off. Gaz. 523, 582 (1941).

(2055) U. S. 2,232,383, Feb. 18, 1941, J. Greig (to Booth Fisheries Corp.), Pressure Freezer. - Claim 1. In a freezing device, the combination of a

plurality of superposed plates and means for exerting force to lift said plates in succession to compress a product to be frozen between the plates, spring means acting against the uppermost plate to resist the compressing force, and a device for indicating the extent of compression of the spring means by said uppermost plate, said device being calibrated to visually correlate the fact of complete freezing with the known ratio of expansion of the product.

Off. Gaz. 523, 699 (1941).

(2056) U. S. 2,233,141, Feb. 25, 1941, S. Musher (to Musher Foundation, Inc.), Treated Paper for Packaging Foods, etc. - Paper used is first treated with an aqueous bath of an antioxidant such as oat flour and then coated with paraffin or the like.

C. A. 35, 3816 (1941)

(2057) U. S. 2,233,142-3, Feb. 25, 1941, S. Musher (to Musher Foundation, Inc.), Paper for Packaging Foods etc. - An antioxygenic compound, such as hydroquinone, guaiacol, phloroglucinal, recorcinol, pyrogallol, lyrosine, eugenol, vanillin, gallic acid, or gallo-lannin is applied to a wrapping paper or the like, with an overcoat of wax. U. S. 2,233,143 relates to a preliminary treatment of the material with an antioxygenic water-soluble extract of seeds or cereals such as an extract of oat flour, with use of an overlying coating of paraffin or the like.

C. A. 35, 3816 (1941).

(2058) U. S. 2,233,170-2, Feb. 25, 1941, C. M. Loane (to Standard Oil Co.), Coated Paper Suitable for Use in Packaging Foods. - A material stable against oxidation is prepared by impregnating the surface of paper with a small amount of an antioxidant such as tertiary-butyl catechol or the like, and then applying a coating of paraffin, petrolatum, or a refined hydrocarbon oil. U. S. 2,233,171 relates to the use of an antioxidant aromatic amine, such as α-naphthylamine, in a generally similar treatment of paper; and U. S. 2,233,172 relates to a similar use of monohydric phenols and naphthols.

C. A. 35, 3816 (1941).

(2059) U. S. 2,234,415, March 11, 1941, W. S. Phillips, Quick Freeze Refrigerator Unit. - Claim 1. An evaporator for a refrigerator, comprising spaced inner and outer shells of sheet material, end wall members engaged between the end portions of said shells for enclosing an evaporator chamber there between a single, longitudinal baffle comprising a strip of material extending to each end wall and having the side edges thereof engaged with the respective surfaces of the shells, refrigerating fluid inlet and outlet means disposed on each side, respectively, of said baffle, two groups of substantially identical longitudinal baffles, formed of strips of material of a width substantially equal to the distance between the shells and of a length substantially shorter than said shells, the members of one group being disposed successively from each side of said single baffle at spaced intervals, the ends of said group abutting one end wall member, the individual members of the other group being disposed between each pair of the first-mentioned group and having their ends abutting the opposite end wall.

Off. Gaz. 524, 364-5 (1941).

(2060) U. S. 2,234,502, Mar. 11, 1941, A. C. Pixton (to Food Machinery Corp.), Method of and Apparatus for Separating Frosted Fruit. - Claim 1. A method of segregating fruit, the pieces of which vary in density, which comprises: (a) discharging said pieces of fruit from a given point, in a uniform manner, into a flowing, flotation medium; segregating said fruit into groups by dividing said fruit in accordance with the depth of the individual pieces thereof in said flotation medium after said pieces of fruit have travelled with said medium a predetermined horizontal distance; restraining, after the aforesaid segregation, that fraction of the lowermost of the aforesaid groups which tends to rise above a given level, from rising above said level, so that said fraction in its further travel with said medium forms a layer substantially on said level; releasing said fraction at a given point in its travel with said medium from restraint against rising upwardly; and at a subsequent point in the flow of said medium segregating said fraction into groups in accordance with the distance which the individual pieces of fruit in said fraction have risen in said medium following the aforesaid release of said fraction.

Off. Gaz. 524, 384-5 (1941).

(2061) U. S. 2,235,209, Mar. 18, 1941, R. P. Fletcher, Jr. (to Booth Fisheries Corporation), Method of Freezing and Packaging Foods. - Claim 4. The method of preparing foods in irregular sizes and shapes for the market which consists in placing in a relatively fragile open top container, a predetermined weight of said food without attempting a regular arrangement thereof whereby some portions of the food project above the side walls of the container and portions of said containers are unfilled, then placing the container in a rigid metal form having an open top and defining therein a space, the lateral and verticle dimensions of which correspond substantially to those of the container, then placing said form and container between refrigerated plates and relatively moving the plates to a defined extent to apply pressure and thereby to compress and rearrange the food so that the container is completely filled and then quick freezing said food while maintaining said pressure condition.

Off. Gaz. 524, 625 (1941).

(2062) U. S. 2,236,050, Mar. 25, 1941, E. R. Anderson, Frozen Product and Apparatus and Method for Producing Same. - Claim 1. A frozen liquid product comprising a layer of individual frozen portions having a continuous flexible separating strip embedded therein in cellular arrangement to define said portions, said cellular arrangement being formed by bending said strip to form sections having adjacent corners, said corners being spaced apart to provide narrow connections of frozen liquid between adjacent portions.

Off. Gaz. 524, 912 (1941).

(2063) U. S. 2,237,255, Apr. 1, 1941, W. J. Finnegan, Method and Apparatus for Quick Freezing and Handling of Comestibles. - Claim 6. Apparatus for refrigerating containers comprising a guide tube for the reception of the containers; refrigerating tubes surrounding portions of the guide tube in spaced relation to each other and to said portions and cooperating with the guide tube to provide annular spaces closed at their ends; means for supplying a refrigerating medium to and moving the refrigerating medium through said annular spaces; a shell of greater length and diameter than the refrigerating tubes enclosing the refrigerating tubes and cooperating therewith to provide an outer annular space closed at its ends; fluid pro-

pelling means; means for feeding containers to the guide tube for revolving the containers and conveying them through the guide tube and for harvesting the containers from the guide tube; and means cooperating with the guide tube, the wall structures of the outer annular space and the fluid propelling means to form a circuit for a heat transfering vehicle; the means for supplying the refrigerating medium including a refrigerant accumulator for the refrigerating medium, refrigerant recirculating pipe connections forming communication between the lower end of the accumulator and the lower ends of the refrigerant tubes, a top liquid and gas refrigerant return pipe forming recirculating connections between top ends of refrigerant tubes and accumulator, a refrigerant liquid supply pipe connection to the accumulator, and a refrigerant gas outlet pipe connection from the accumulator.

Off. Gaz. 525, 224-5 (1941).

(2064) U. S. 2,237,256, Apr. 1, 1941, W. J. Finnegan, Method and Apparatus for Multistage Freezing of Comestibles. - Claim 1. In combined multistage fluid cooling and produce refrigerating apparatus, refrigerating devices comprising an inclosed casing, superposed endless product conveyor belts in the casing, a plurality of vertically aligned uninterrupted heat transferring surfaces extending longitudinally of the casing and arranged in close relation above and below the product conveyor belts with a clear space between the heat transferring surfaces and said belts, fluid propelling means and means cooperating with said fluid propelling means to cause the fluid to move in two separate independent streams, each stream flowing in alternating contact with the heat transferring surfaces and the produce on said belts.

Off. Gaz. 525, 225 (1941).

(2065) U. S. 2,237,257, Apr. 1, 1941, W. J. Finnegan, Method and Apparatus for Rapid Refrigerating and Handling of Foods. - Claim 1. A method of refrigerating material by successively removing fractional parts of the total heat required to be removed from the material; said method consisting of first subjecting the material to the convection currents of a body of air cooled by direct contact with refrigerated surfaces within an initial stage; thereafter progressively subjecting the material to heat exchange with air streams of progressively lower temperature, each stream being circulated through a continuous closed path separated from the path of each of the other streams and from said initial stage; and finally subjecting said material within a final stage to the convection currents of a body of refrigerated air cooled to a temperature lower than any of the air stream temperatures by direct contact with refrigerated surfaces.

Off. Gaz. 525, 225 (1941).

(2066) U. S. 2,238,972, Apr. 22, 1941, F. D. Chapman, Blancher. - Claim 1. A system for blanching comestibles comprising; means for transporting segregated batches of the material along a definite path, and means for circulating heating medium through each of said batches for a predetermined period of time during advancement thereof.

Off. Gaz. 525, 889-90 (1941).

(2067) U. S. 2,242,527, May 20, 1941, F. W. Knowles, Quick Freezing of Packaged Foodstuffs. - Claim 1. A refrigeration device, comprising a first and a second plate for supporting therebetween a layer of packages in contact with opposed faces of said plates, said plates having radiation faces, radiation fins on said radiation faces, means for moving said plates to and

from each other, means for refrigerating said radiator faces and fins, and means for progressing one of said plates parallel to the other to feed packages in and out of said device.

Off. Gaz. 526, 686 (1941).

(2068) U. S. 2,254,406, Sept. 2, 1941, M. T. Zarotschenzeff (to National Frosted Foods, Inc.), Method and Apparatus for Quick Freezing. - Claim 1. A freezing apparatus comprising a casing and a plurality of spaced refrigerating elements arranged therein, each of said elements consisting of a frame and a pair of closed walls cooperating with the frame to provide an enclosed space in said element, means of supplying each of said cooling elements with a liquid refrigerant, and means for withdrawing the used refrigerant therefrom, said walls being made from a highly extensible resilient material having the characteristic of being able to conform at low temperatures substantially to the shape of the materials confronting the wall.

Off. Gaz. 530, 91 (1941).

(2069) U. S. 2,256,021, Sept. 16, 1941, J. F. Furry and A. D. Ames (to Outboard, Marine and Manufacturing Co.), Freezing Apparatus. - Claim 5. In a refrigerating apparatus, a freezing chamber and an adjacent source of artificial light, said chamber including the combination of a base, a removable elongated housing of U-shaped transverse section, an interior shelf, supported and spaced from said base, a refrigerant conducting conduit encircling and spaced from the sides and top of the freezing chamber and having its bottom portion rigidly secured to the base to permit heat transfer between the conduit and the base, and a rear wall enclosing the end of said housing and adapted to admit rays of said artificial light from the blue green end of the spectrum while excluding heat rays.

Off. Gaz. 530, 607 (1941).

(2070) U. S. 2,260,450, Oct. 28, 1941, J. E. Guinane (to General Foods Corp.), Method of Freezing Food Products. - Claim 1. The method of packaging and quick-freezing a flowable food product in a relatively thin collapsible rectangular container which comprises confining said container sufficiently to maintain its shape and prevent collapse, filling said confined container with said product, closing said container tightly around the confined flowable product to eliminate air from the container and sealing the confined container, then enclosing said container on all sides within refrigerated rigid heat-conductive walls to quick-freeze said product while maintaining at least one side under yielding pressure, and then removing said walls, whereby a tightly wrapped quick-frozen unit of rectangular shape is obtained.

Off. Gaz. 531, 880 (1941).

(2071) U. S. 2,261,466, Nov. 4, 1941, E. E. Habib (to Dewey and Almy Chemical Company), Envelopes for Protecting Foods such as Meats During Refrigeration and Storage. - Envelopes (which may be formed smaller than desired, as by dipping process, and then stretched to desired size) are formed of unvulcanized rubber with an admixture of a wax such as paraffin wax, ceresin wax, beeswax or carnauba wax 2-45%.

C. A. 36, 1107 (1942).

(2072) U. S. 2,263,241, Nov. 18, 1941, J. O. Harvey (to E. L. Mohr (assigned ½)), Means for Quick Freezing Food Packages. - Claim 1. Means for quickly

freezing a food package comprising in combination, a freezing chamber for receiving the package, a refrigerant conducting line correlating with said chamber for reducing the temperature therein, a controlling valve for said line normally biased to a closed position, a closed housing for extension from an end thereof into the package, an electrically operating mechanism for opening said valve including an operating circuit having a pair of terminals connected to the housing, and a thermostatic controlling structure for said mechanism within said housing correlating with said terminals and said terminals and adapted when the housing is initially inserted in the package for closing said circuit whereby said mechanism will open said valve and when the temperature lowers to a predetermined degree within the package and the housing for opening said circuit whereby said valve will automatically move to closing position with respect to said line.

Off. Gaz. 532, 674 (1941).

(2073) U. S. 2,263,452, Nov. 18, 1941, C. Birdseye (to Mechanical Research Inc.), Process and Apparatus for Freezing Food Products. - Claim 1. The process of freezing food products, which includes the steps of moving the product, while immersed in liquid refrigerant, across a refrigerated surface until the refrigerant is partially converted to slush, separating the product from the liquid and slush, and partially liquefying the slush by contacting the liquid containing it with unfrozen product on its way to the refrigerating surface and thereby chilling the unfrozen product.

Off. Gaz. 532, 724 (1941).

(2074) U. S. 2,273,063, Feb. 17, 1942, S. Musher (to Musher Foundation Inc.), Paper Containers or Wrappers for Food. - Paper used is treated with an aqueous dispersion of an antioxidant such as an extract of oat or corn flour, together also, if desired, with other materials such as hydro-quinone, α-naphthol, catechol, naphthylamine, aminophenols, gum guaiac, vanillin, and a waterproofing material such as paraffin. Numerous materials are mentioned which may be used. Cf. U. S. 2,233,142-3.

C. A. 36, 3880 (1942).

(2075) U. S. 2,278,472, Apr. 7, 1942, A. Musher (to Musher Corporation), Dehydrated Prefrozen Food Product. - Claim 1. The process of producing a relatively unexpanded, structure disrupted, substantially dry, quickly water permeable food piece, said process comprising slowly freezing the food piece so as to develop large ice crystals therein and then, dehydrating the food piece so as to produce a relatively dry and dehydrated food piece therefrom. Claim 3. The method of producing an exploded, expanded, structure disrupted, water permeable, substantially dry food piece, said method comprising slowly freezing the food piece so as to develop large ice crystals therein, then dehydrating the food piece, and then subjecting the food piece to an elevated pressure and subsequently instantly releasing said pressure to a lower pressure.

Off. Gaz. 537, 50 (1942).

(2076) U. S. 2,281,513, Apr. 28, 1942, F. H. Reichel and R. T. K. Cornwell, (to Sylvania Industrial Corp.), Wrapping Material for Frozen Foods such as Frozen Fruits, Berries, Meats, Vegetables, Fowls or Fish. - A flexible wrapping material is used which does not adhere to the wrapped food and which protects it from desiccation or freezer burn, the wrapper being formed of a nonfibrous cellulose material such as a pellicle of regenerated cellulose containing a plasticizer including water, glycerol, and diethyl glycol

which maintain the wrapper flexible at sub-atmospheric temperatures.
C. A. 36, 5578 (1942).

(2077) U. S. 2,282,525, May 12, 1942, W. R. Maguire, Quick Freezing Apparatus. - Claim 1. Apparatus for the quick freezing of fluids such as cream, including a moving endless metal belt, means for delivering a layer of fluid onto the belt, a continuous heat conductive surface in which refrigerating pipes are embedded said surface being in contact with the major portion of the under side of the upper reach of the belt, a vibrator acting on an unsupported portion of the belt for freeing the frozen fluid from the surface of the belt, means for severing the frozen fluid into sheets of substantially uniform length and an insulated cabinet enclosing the belt and refrigerating pipes.
Off. Gaz. 538, 334 (1942).

(2078) U. S. 2,286,225 June 16, 1942, H. A. Noyes (to Z Pack Corporation), Freezing Process. - Claim 2. A process of quick freezing fresh fruits in loose formation, which comprises flowing a refrigerant sugar solution, of which at least substantially half of the total sugar content is levulose, alternately over cooling means to maintain said solution at a quick freezing temperature of between 2° F. and 25° F. and over the product to be frozen until the said product is substantially frozen, the physical properties of said solution being such that it flows rapidly over said cooling means and over the product and drains rapidly from the surfaces of the said product so as to be continuously replaced by fresh cold solution, with the result that the surface layers of said product are hard frozen almost instantly and before the osmotic effect of the sugar solution on said surfaces has withdrawn juice from the product being frozen to an appreciable extent, said quick frozen product acquiring a protective film of the refrigerant solution which brightens its appearance and protects the product against dehydration during subsequent storage in the warehouse, said refrigerant solution having a concentration not greater than 8 mols and a viscosity of the order of 70 centipoises at temperatures between 2° F. and 25° F.
Off. Gaz. 539, 536 (1942).

(2079) U. S. 2,290,392-3 July 21, 1942, G. C. Thomas (to The Lummus Co.), Flexible, Moistureproof Compositions Suitable for Coating Paper for Wrapping Frozen Foods, etc. - A polymerization product of buta diene is dispersed in a wax such as scale wax, or paraffin melting at 127-140° F. while both materials are maintained in a fluid state, as by use of a solvent of low boiling point, the dispersion being carried out in an attenuated stream subjected to a substantial centrifugal force so that a homogenious mixture is formed which will not separate into its constituents on continued melting and congealing. U. S. 2,290,393 relates to the production of a product of generally similar type and character from a polymerization product of isobutylene of a molecular weight of at least 50,000 and a wax such as paraffin.
C. A. 37, 485 (1943).

(2080) U. S. 2,300,229, Oct. 27, 1942, F. W. Knowles, Freezer for Peas and Other Produce. - Claim 3. A produce freezing apparatus of the class described, comprising: an insulated container, a compartment communicating with the upper end of the container, a feeder tray extending through said compartment, said container having an inlet opening communicating with said compartment, said feeder tray extending through the opening for delivering

produce into said container, means for creating a current of cooled air, and for removing sensible heat from the produce while said produce passes through the compartment and over the feeder tray, agitating and conveying means located within the container for passing the produce progressively from a higher to a lower temperature region in its path through the container, means for admitting a blast of low temperature air into the lower end of the container, and means for removing the air from the upper end of the container.

Off. Gaz. 543, 805 (1942).

(2081) U. S. 2,304,465, Dec. 8, 1942, P. Maniscalco, Refrigerator With Deep Freezing Chamber. - Claim 1. A refrigerator comprising a cabinet having heat insulated walls, a jacket containing double walls providing a chamber there between having a freezing unit mounted therein, said jacket constituting a freezing chamber for freezing foods therein and being mounted across said cabinet adjacent one of its walls, providing between it and the adjacent wall a small chamber which is open at the front and is adapted to receive a group of ice trays therein said jacket also providing between it and the other part of the cabinet a larger space for storage of foods and the like, and door means adjustable for length being removably mounted in part of the front opening of said small chamber, adapted to cooperate with those trays of the group which are installed in said chamber and provide a small auxiliary storage chamber.

Off. Gaz. 545, 353 (1942).

(2082) U. S. 2,304,860, Dec. 15, 1942, R. B. Taylor, Apparatus for Freezing Foods. - Claim 1. In an apparatus for freezing a comestible by direct contact of the comestible with a body of refrigerant liquid, (a) a vessel providing a container for the body of refrigerant liquid, (b) means for maintaining the temperature of the refrigerant liquid in the vessel below the freezing temperature of the comestible, (c) means for directing a stream of said refrigerant liquid through said vessel within said body of refrigerant liquid, (d) a mobile, liquid permeable member adapted to support units of the comestible to be frozen in a body of units having a relatively small dimension, (e) means for supporting at least a portion of said liquid permeable member within said vessel below the surface of said body of refrigerant liquid and substantially perpendicular to the path of said stream of refrigerant liquid, and (f) means for moving said liquid permeable member and the body of comestible units supported thereby through said body of refrigerant liquid transversely of said stream of refrigerant liquid and with the liquid permeable member positioned to support the body of comestible units against displacement in the direction of flow of said stream of refrigerant liquid, whereby said body of units is caused to be traversed by said stream of refrigerant liquid in the direction of the small dimension of said body.

Off. Gaz. 545, 493 (1942).

(2083) U. S. 2,305,643, Dec. 22, 1942, A. E. Stevenson and K. T. Swartz (to Continental Can Co.), Art of Preserving Green Foodstuffs and Maintaining the Color Thereof. - Claim 1. The process of preserving peas and other green foodstuffs and retaining the color thereof, which includes soaking the foodstuff for substantially three to thirty minutes at substantially room temperature in an alkaline solution containing an alkali metal hydroxide in a concentration substantially of N/5 to N/10, blanching in a substantially neutral aqueous bath at a temperature of substantially 180° F. and thereafter processing in a sealed container.

Off. Gaz. 545, 720 (1942).

(2084) U. S. 2,318,736, May 11, 1943, C. Birdseye (to Mechanical Research, Inc.), Art of Treating Food Products. - Claim 1. Apparatus of the class described including in its structure a plurality of refrigerated plates, means for advancing a product along the surface of said plates successively, and means for leveling the product upon the plates in layers of predetermined thickness.

Off. Gaz. 550, 250 (1943).

(2085) U. S. 2,329,472, Sept. 14, 1943, C. H. Koons (to Industrial Patents Corp.), Preparing Food Products such as Green or Cured Hams for Freezer Storage. - An aqueous frozen glaze is formed on the surface of the material from an aqueous suspension containing 10-20% of bentonite, fuller's earth, kieselguhr, diatomaceous earth, silica gel, chalk, carbon black, kaolin or clay (mention also being made of the possible conjoint use of various other auxiliary materials).

C. A. 38, 1042 (1944).

(2086) U. S. 2,332,367, Oct. 19, 1943, C. Birdseye (to Mechanical Research, Inc.), Freezing Food Products. - Claim 1. The process of freezing a food product, which includes the steps of passing the product along and in contact with a horizontal refrigerated heat-conductive surface, meanwhile wetting both the surface and the product with a refrigerating liquid having a temperature lower than that of the product being frozen and higher than that of the said refrigerated heat-conductive surface.

Off. Gaz. 555, 502 (1943).

(2087) U. S. 2,336,928, Dec. 14, 1943, F. E. Denny (to Boyce Thompson Institute for Plant Research, Inc.), Fruit Preservation. - Claim 1. A process for the substantially complete inactivation of the browning system causing discoloration of freshly cut surfaces of plant tissue, which comprises treating the freshly cut plant tissue with an aqueous solution of thioamide, and subsequently subjecting the cut plant tissue to a freezing temperature in the course of which the thioamide associated with the cut plant tissue in conjunction with the freezing temperature effects substantially complete inactivation of the browning system.

Off. Gaz. 557, 373 (1943).

(2088) U. S. 2,339,300, Jan. 18, 1944, R. B. Taylor (to Tennessee Valley Authority), Refrigerant Composition. - Claim 1. A process of freezing and preserving a comestible, selected from the group consisting of fruits and vegetables with acidic characteristics and having a composition such that it normally discolors readily when stored in a frozen condition, which comprises: (a) preparing an aqueous invert sugar refrigerant solution suitable for freezing said comestible in direct contact therewith by inverting sucrose with an acid inverting agent and neutralizing the acid in the invert sugar solution so formed to a hydrogen ion concentration adapted to prevent said discoloration, (b) containing said comestible with resulting refrigerant solution maintained at a temperature below the freezing point of said comestible until said comestible is frozen, (c) separating the frozen comestible from said refrigerant solution, and (d) storing said comestible at a temperature to maintain the same in the frozen condition.

Off. Gaz. 558, 380 (1944).

(2089) U. S. 2,340,145, Jan. 25, 1944, A. J. Rogers, Process of Preserving Fruit. - Claim 1. The method of treating fruit to preserve the natural color, flavor and texture thereof which comprises preparing the fruit for packing, adding sugar to the fruit in the minimum proportion of three parts of sugar by weight to 5 parts of fruit, agitating the mixture of fruit and sugar to distribute the sugar throughout the fruit more or less uniformly, maintaining the fruit at a temperature between 0° and 32° F. and at not to exceed normal pressure for a minimum period of from one to four weeks from and after the addition of the sugar, subsequently removing the mixture from cold storage, promptly thereafter heating the mixture to a temperature of between 140° and 185° F., and finally storing the fruit in a sealed container. Off. Gaz. 558, 630 (1944).

(2090) U. S. 2,342,468, Feb. 22, 1944, N. A. Hallwood, Food Preserving and Storage Apparatus. - Claim 1. A conveyor for supporting and moving material comprising driving and idler pulley members journaled in spaced relation for rotary movement about vertical axes, an endless flexible motion transmitting element extending around said members, means for adjusting one of said members to vary the spacing there-between and eliminate slack in said motion transmitting element, an endless guide disposed in parallel relation to said flexible element, a plurality of wheeled carriers, a plurality of follower elements mounted on each carrier and cooperating with said guide to confine said carriers to a predetermined path of movement, and means secured to said flexible element for movement in unison therewith, said means having adjustable connections with said carriers to compensate for variations caused by adjustment of said pulley member.
Off. Gaz. 559, 659-60 (1944).

(2091) U. S. 2,342,706, Feb. 29, 1944, J. O. Tankersley (to Tennessee Valley Authority), Freezing Foodstuff. - Claim 1. A method of freezing foodstuff which comprises: (a) supplying to a rotatable foraminous walled container with foodstuff therein a continuous stream of refrigerant liquid maintained at a temperature below the freezing point of said foodstuff, (b) removing said refrigerant liquid through the walls of said container at a rate of at least equal to the rate of supply of said liquid thereto, (c) maintaining said refrigerant liquid supply until the foodstuff is frozen, (d) terminating the supply of said refrigerant liquid, and (e) rotating said container at a speed effective to remove from said foodstuff substantially all of said refrigerant liquid.
Off. Gaz. 559, 764 (1944)

(2092) U. S. 2,361,649, Oct. 31, 1944, L. A. M. Phelan, Freezing, Hardening, and Dispensing Cabinet and Container Therefor. - Claim 1. An arrangement for temporary storage for frozen confections; comprising a cabinet enclosing a compartment having arranged therein a number of containers for the confections, said compartment having a uniform rectangular cross-section from top to bottom and having access openings at the top of the cabinet, a cooling coil arranged in heat exchange relation with the lower portions only of at least the side walls of the compartment, the containers being arranged in the compartment in sets, one set overlying and resting upon the tops of an underlying set, each container being substantially uniform in rectangular cross-section, the end walls thereof being spaced further apart than the side walls of the container, each of said containers being positioned in the compartment with its side walls parallel to the end walls of the compartment.
Off. Gaz. 567, 843 (1944).

(2093) U. S. 2,363,818, Nov. 28, 1944, A. R. Thompson (to Food Machinery Corporation), Food-Processing Apparatus. - Claim 1. Apparatus of the character described comprising a chamber having an inlet and an outlet, a reel rotatable within said chamber, said reel having a plurality of equally spaced apart container pushing rolls disposed longitudinally thereon and extending from said inlet to said outlet, the adjacent rolls forming troughs between them for receiving and supporting containers, means to introduce the containers in succession through said inlet and to deposit them one by one in the troughs between said rolls, and means to move the containers axially along said rolls from said inlet to said outlet when pushed by said rolls upon rotation of said reel.

Off. Gaz. 568, 682 (1944).

(2094) U. S. 2,372,373, Mar. 27, 1945, J. L. Gilson, Method and Apparatus for Freezing Foods. - Claim 10. Apparatus for rapidly freezing foodstuffs by direct contact with a liquid of low freezing point, comprising a foraminous conveyor for transporting a single layer of said foodstuffs in a generally horizontal direction, means directly above and in closely spaced relation to said layer and propagating, by the force of gravity, a plurality of solid streams of said liquid of low freezing point to fall over substantially the entire width of said layer and over a substantial part of the length thereof and in sufficient volume to cascade over and around said foodstuffs, and means arranged directly under said conveyor for collecting the spent liquid, the propagation of said streams by the force of gravity providing a low impact velocity of said streams against said foodstuffs.

Off. Gaz. 572, 631-2 (1945).

(2095) U. S. 2,376,583, May 22, 1945, H. M. J. Tyrel de Poix (to Dewey and Almy Chemical Co.), Process for Preserving Perishable Foodstuffs. - Claim 5. Process for preserving perishable foodstuff by refrigeration which includes providing a flexible moisture impermeable envelope which has been stretched to a material extent and to a size larger than the foodstuff and retains substantially its stretched size at or below normal room temperatures and is capable of subsequently materially contracting when heated and again becoming dead and inelastic at refrigerating temperatures, placing the foodstuff in the envelope, causing the envelope to contract by the action of heat into contact with the foodstuff and thereafter storing the foodstuff in the envelope at refrigerating temperatures.

Off. Gaz. 574, 698-9 (1945).

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* Abstract numbers marked with an asterisk contain mention of quick freezing. A few important references in certain classes are underlined for special attention.

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